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ABSTRACT

The first of several planned volumes of Free Response Test Items contains geology questions developed by the Assessment and Evaluation Unit of the New South Wales Department of Education. Two additional geology volumes and biology and chemistry volumes are in preparation. The questions in this volume were written and reviewed by practicing teachers having a speciality in geology. The content coverage does not follow any syllabus but represents material for use by teachers in devising teaching and assessment programs. The free response questions require word or statement answers, drawings, or labeling concerning weathering; soils; stream, coastal, glacial, wind, and other forms of erosion and deposition; and structures formed by sedimentation. Many questions are based on diagrams, maps, tables, and other illustrations of geological features, processes, and experiments. No answer keys are given. (CM)

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New South Wales Department of Education

SCIENCE

FREE RESPONSE TESTING PROGRAM

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GEOLOGY

(PART ONE)

SCIENCE LIBRARY OF TEST ITEMS VOLUME 23

FREE RESPONSE TESTING PROGRAM

GEOLOGY

(PART ONE)

VOLUME 23 IN

THE SCIENCE LIBRARY OF TEST ITEMS

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Introduction

This is the first several planned volumes of Free Response Test Items. It is hoped, over the next few years, to produce similar volumes in other areas of geology as well as in the other branches of science.

Under preparation at present are the following:

* Geology Free Response - part 2 - containing material on rocks, minerals, economic geology, fossils and geological time.
* Geology Free Response - part 3 - earthquakes plate tectonics, geological mapping and structures.
* Biology Free Response - part 1 - organ systems of the human body.
* Chemistry Free Response - part 1 - atoms, elements, metals and non-metals, mixtures, separations and solutions.

This first volume was written and renewed by practising teachers having a specialty in the field of geology. The questions in it however, have not been pretested as the nature of most of them does not require this. There may therefore be faults with some questions which a pretest program may have identified. Teachers are advised to check each question carefully before use to determine its suitability and to make changes to questions if student responses indicate that this is necessary.

The classification of the contents represents a concensus of opinion, and several arguments, from the same group of teachers. It represents only the strongest opinion at the time and there were obviously many other possible, and perhaps more logical groupings. Feel free to regroup the pages according to your desires.

It must also be stated that the content coverage in the volume does not follow any syllabus on course. It is NOT a prescriptive statement of content. The questions simply represent material which we hope will be of use to teachers in devising their teaching and assessment programs.

Content has been selected on the basis of what is commonly taught in some schools. Others may teach more or less than this. If you teach a geological topic other than those in this volume or pre-empted by the list of future volumes above please write and tell us about it, and perhaps become involved in the production of your material.

All comments and criticisms are most welcome as these assist us in evaluating our product. Please address all correspondence to:

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Acknowledgements

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As well, some material, written for the item bank several years ago was adapted for this collection. This was written by Ralph Suters from Berkely High School, and several other people we are no longer able to identify. Ralph's contribution, and the contribution of these others is also acknowledged.

Brian Shadwick
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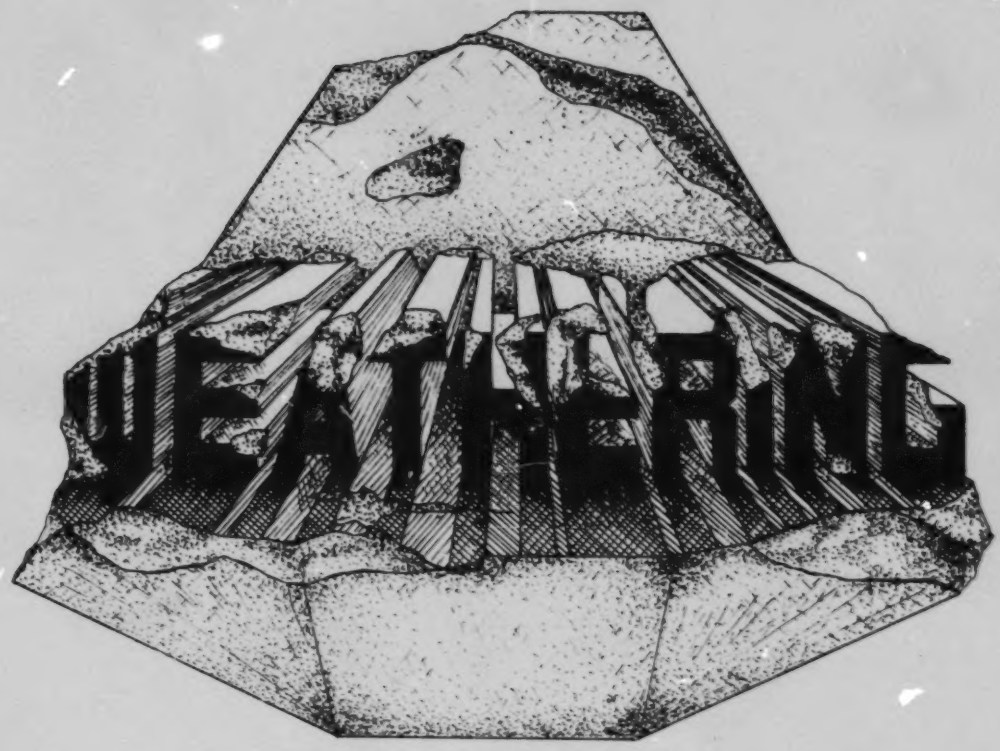

WEATHERING

1. What is weathering?

2. What is erosion?

3. What is physical weathering?

4. Give two examples of physical weathering?
   a)
   b)

5. What is chemical weathering?

6. Give two examples of chemical weathering.
   a)
   b)

7. Briefly explain how biological factors can cause weathering.
   Use these examples:
   a) Physical Biological Weathering.

   b) Chemical Biological Weathering.

Classify each of the following as either

(a) Physical weathering or
(b) Chemical weathering or
(c) Biological weathering.

(i)	Water freezing in cracks in rocks causing them to break.	
(ii)	Wind-carried dust and sand sculptured shapes in sandstone.	
(iii)	Lichens and mosses growing on rocks produce acids which wear away the rocks.	
(iv)	Surface minerals change due to contact with oxygen and moisture in the air.	
(v)	Dissolving of limestone by water containing dissolved carbon dioxide.	
(vi)	Hot days and cold nights cause layers to split off granite boulders.	
(vii)	Water seeping into pores in rocks changes minerals into more soluble forms.	
(viii)	Water, carrying various sized stones, wears away a river bed.	
(ix)	Roots of plants growing in cracks in rocks cause them to break.	
(x)	A piece of granite changes into a soft crumbly rock.	

Some of the processes in (i) to (x) above have special names. What names are given to:

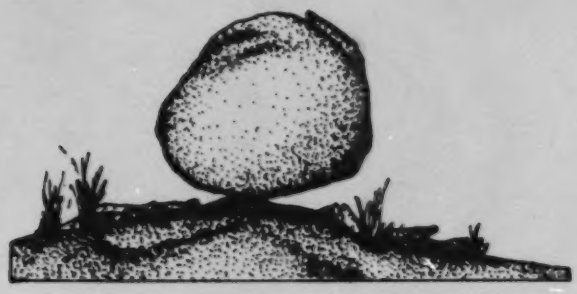
(i) _____

(ii) _____

(iii) _____

(iv) _____

The questions on this page refer to this diagram:



1. What is this rock structure called? _____

2. What sort of rock is the boulder made from? _____

3. What minerals would you expect to find in this rock? (List 3)

   A. _____

   B. _____

   C. _____

4. What colour would the rock most probably be? _____

5. Briefly explain how this structure has been formed.

   _____

   _____

   _____

   _____

   _____

6. Name two areas in N.S.W. where you would expect to find structures like this (A) _____

   (B) _____

7. Briefly describe the colour, texture and quality of the soil you would expect to find in a region which had rocks like this. Explain each answer.

   (A) Colour _____

   _____

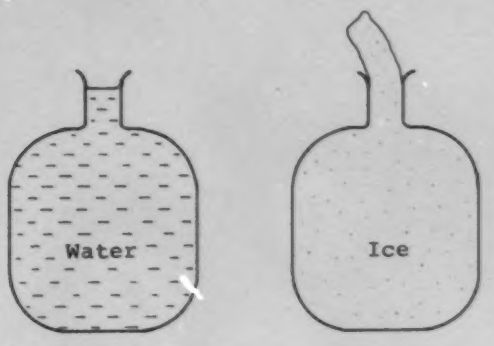
   (B) Texture _____

   _____

   (C) Quality _____

   _____

The questions on this page refer to the following diagrams showing a bottle of water before and after the water has been frozen.



1. Why does the ice stick out from the neck of the bottle after freezing?

_____
_____
_____
_____
_____
_____
_____

2. What has this to do with the weathering of rocks?

_____
_____
_____
_____
_____

3. What is the weathering process you have described in (2) called?

_____

4. Where in N.S.W. is this process most likely to occur?

_____

5. Is this process a physical or a chemical process?

_____

1. Classify each of the following features as caused by physical or chemical weathering. (Write P or C next to each)

Features	
honeycomb weathering	
sink holes	
clay deposits	
underground limestone caves	
spheroidal weathering	
granite tors	
pot holes	

2. Briefly explain how each of the features in the table above are formed:

(a) Honeycomb weathering _____

_____

_____

(b) Sink holes _____

_____

_____

(c) Clay deposits _____

_____

_____

(d) Underground limestone caves _____

_____

_____

(e) Spheroidal weathering _____

_____

_____

(f) Granite tors _____

_____

_____

(g) Pot holes _____

_____

_____

A stonemason purchases a block of granite and leaves it sitting on a pedestal for many years.

1. Which part of the block will weather?

   (a) fastest _____

   (b) slowest _____

   (write face, edge or corner as your answers)

2. Explain your answers:

   _____

   _____

   _____

   _____

   _____

3. Draw a diagram of the state of the <u>block</u> after it has stood in the weather for thousands of years.

   (it is not necessary to draw the stand)

4. What name is given to this sort of weathering process when it occurs in nature? _____

5. What is the <u>usual</u> cause of this sort of weathering?

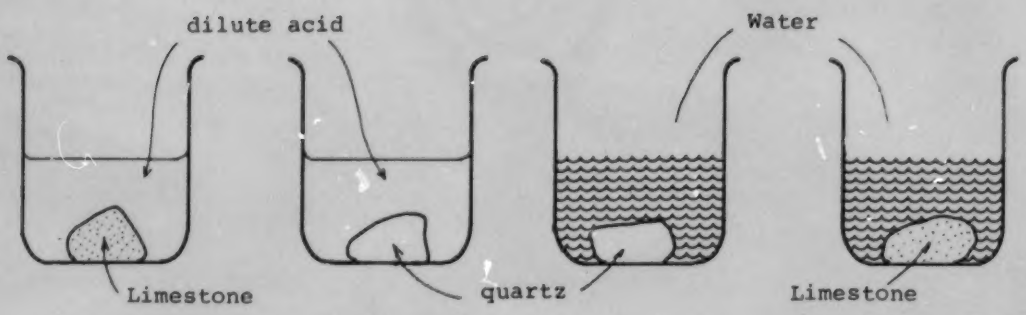
   _____

6. What name is given to the rocks which are formed by this process? _____

7. Where in N.S.W. would you find rocks like these?

   _____

The questions on this page refer to these diagrams.



Beaker	What is happening in each beaker	What would you observe after several days
A		
B		
C		
D		

2. What conclusion could be drawn from this experiment?

3. Briefly explain how this kind of weathering occurs in nature.

4. How would sandstone react if it was placed in a beaker of

   (a) water: _____

   (b) acid: _____

1. Briefly describe the weathering of:-
   a) Limestone by water.

   _____

   _____

   _____

   b) Granite boulders by extreme temperature changes.

   _____

   _____

   _____

   c) Which 3 minerals are most resistant to the weathering processes?

   (i)_____

   (ii)_____

   (iii)_____

2. 3 different mineral groups weather to form clay minerals as the main product. What are these 3 groups?

   A) _____

   B) _____

   B) _____

3. What happens if plant roots grow into cracks in rocks?

   _____

   _____

4. Explain why quartz is a common constituent of weathered rock.

   _____

   _____

5. What happens to a sample of limestone or calcite if you drop hydrochloric acid on it? _____

6. How do living organisms assist chemical weathering?

   _____

   _____

   _____

   _____

   _____

The questions on this page refer to this diagram of a statue.

The statue survived several centuries with very little change to its surface.

However, during the last 50 years it has begun to weather badly, as can be seen in the diagram.

1. What type of weathering is most probably causing the breakdown of the statue, physical or chemical? _____

2. List 3 possible reasons why the statue has decayed more rapidly lately.

   (a) _____

   _____

   (b) _____

   _____

   (c) _____

   _____

3. Name 3 substances in the air which may be responsible for the weathering.

   (i) _____

   (ii) _____

   (iii) _____

4. Describe one way in which the weathering may have been prevented, or may be halted now.

   _____

   _____

1. Match the weathered product with the original mineral from which it was chemically weathered, by writing the name of the original mineral in the space provided.

Original mineral	Weathered product	Choose original minerals from
	clay	calcite
	iron oxides	feldspar
	iron oxides	ferro-magnesians
	hydrogen carbonate	mica
	none	quartz
		galena

2. Complete the table below by writing the names of the minerals present in each rock which are least affected by chemical weathering, and most affected by chemical weathering.

Rock	Least affected mineral	Most affected mineral
Granite		
Basalt		
Sandstone		
Shale		

3. What is the main solid mineral formed from the chemical weathering of:

a. feldspars _____

b. mica _____

c. ferro-magnesians _____

1. What is the major type of weathering which occurs in each of the following climatic areas?
   For your answers choose (i) chemical weathering
   or (ii) mechanical weathering
   or (iii) both chemical and mechanical.

   A. alpine areas _____
   B. arctic areas _____
   C. deserts _____
   D. humid equatorial areas _____
   E. temperate zones _____

2. Name two agents of weathering in each of the areas given:-

Area	Agents of weathering
alpine areas	i) ii)
arctic areas	i) ii)
deserts	i) ii)
humid equatorial areas	i) ii)
temperate zones	i) ii)

3. Arrange the 5 areas (above) in order of the rate at which they would cause a piece of granite to become weathered. Start with the fastest.

   fastest _____
   _____
   _____
   _____
   slowest _____

4. Briefly explain the difference between physical and chemical weathering.

   _____
   _____
   _____
   _____
   _____

Classify the following statements as TRUE (T) or FALSE (F) by writing (T) or (F) in the square next to the number of each statement.

T or F	NO.	STATEMENT
	1	Weathering is the removal of rock material by water, wind and ice
	2	When a rock weathers, it breaks into smaller pieces
	3	The final product of rock weathering is soil
	4	When mechanical weathering occurs minerals turn soft and crumbly
	5	Soil is formed by farmers who break up the bedrock with their tractors
	6	Chemical weathering occurs when rocks decompose
	7	When water freezes, the volume of ice formed is smaller than the original water volume
	8	Rocks break up under the action of mechanical weathering processes
	9	Ice wedging, oxidation and temperature changes are all processes of mechanical weathering
	10	Biological weathering includes the action of plant roots and trail bikes

Answer these questions by filling-in the missing words

1. Material produced by frost shattering would be _____ in shape.
2. The organic material found in soil is called _____.
3. The most common mineral formed by chemical weathering is _____.
4. Rocks decompose as a result of _____ weathering.
5. Frost wedging occurs because water _____ when frozen.
6. _____ is the mineral which is most resistant to the weathering processes.
7. Chemical weathering changes the _____ of the minerals in rocks.
8. The wearing away of a river bed by rocks tumbling along is called _____.
9. _____ rocks will weather more quickly than _____ rocks.

Match the descriptions of weathering processes to their names by writing the letter of the description next to the most appropriate name. Names may be used for more than one process or not at all.

Description of Process	Names	Letter
A. Wind-carried particles wear away other rocks.	Abrasion	
B. River-carried pebbles wear away a river bed.	Erosion	
C. Hot days and cold nights cause layers to split off rocks.	Exfoliation	
D. Water combines with minerals, they expand and crack rocks.	Hydration	
E. Soluble minerals are dissolved by water.	Hydration expansion	
F. Surface layers of minerals change due to contact with oxygen.	Oxidation	
G. Minerals react with water.	Salt crystallization	
H. Minerals react with salts in sea water and get leached out of the rocks.		

Weathering of Rocks

Fill in the missing words in these paragraphs using the list below. Not all of the words in this list fit suitably into the blanks in the passage, and some may be used more than once.

abrasion, breakdown, can, cause, caves, chemical combination, contraction, cracks, dissolves, erosion example, exfoliation, expands, foce, freezing, freezes, ground, iron layers, minerals, occur, or, orange, oxidation, oxides, physical, pressure, processes, rainwater, rates, red, river, rocks, sand, shattering, solution, split, temperature, water, weak, weathering, with.

Weathering is the _____ of rocks by either _____, chemical, or biological _____.

In cold climates, _____ seeping into cracks in _____ may freeze overnight. It _____ as it freezes and this expansion puts very large _____ on the rocks. As a result the rocks may _____.

Hot days and cold nights may cause uneven _____ of expansion and _____, causing outer _____ of rock to _____ off. This is known as _____.

Wind blown _____ particles, or small _____ carried along by a running _____, grind against other rocks or the river bed. This action slowly wears away the river bed, and _____ in the desert. This form of weathering is called _____.

Chemical weathering may _____ as rainwater soaks into the _____. As it moves through the soil it _____ some minerals and becomes a _____ acid solution. This reacts _____ limestone, dissolving it, causing _____ and sink holes.

Chemical weathering _____ also occurs when water and oxygen react with _____ in rocks. Reaction _____ oxygen is called _____ and this changes many iron minerals into iron _____. These are very visible _____ soils because they are coloured _____ and _____.

Tree roots may _____ their way into _____ in rocks causing the rocks to _____. This is an _____ of biological weathering.

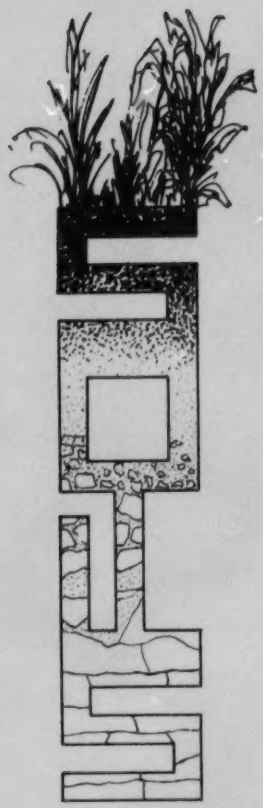
1. Each of the jumbled words in column A has something to do with weathering. Rewrite the words in column B using their correct spellings. One letter (the first or last) is given for each as a clue.

A	B
EIGAWTHREN	G
NSIREOO	N
LASICYHP	P
BRANASOI	A
LIMCAHCE	C
RTOS	S
YLAC	C
RAZTUQ	Q
GLOCLOBIIA	B
RTGINHSAET	G

A	B
VCASE	
MEYBONHOC	B
TEXLOFANOII	E
SIMNOTLEE	E
SSODVELI	D
NUTLOISO	N
SANPEXNOI	E
NATDOXOII	N
RETRAWAIN	R
KABRONWED	N

WEATHERING WORD MAZE

2. Using the words you have just unjumbled, construct a word maze by hiding the words horizontally, vertically or diagonally in a maze of other letters.



What Do You Know About Soil?

1. What is a soil? _____

2. Where would you look to find a well-developed soil?

3. About how long do you think it takes to form soil?

4. What is soil useful for?

5. Describe four different types of soil that form in your local area.

   i _____

   ii _____

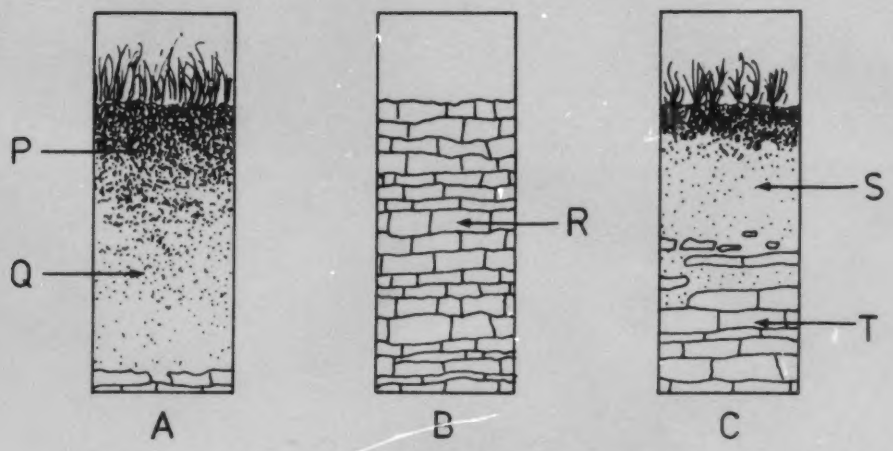
   iii _____

   iv _____

6. Explain how you think a soil is formed?

7. Draw a cross-section of a soil in the space below and label as many parts of it as you can.

The questions on this page refer to the diagrams below. The diagrams show different stages in the formation of soil.



1. What do we call diagrams like these? _____

2. What is the order of these diagrams from FIRST to LAST?

   _____

3. Give the names for each of the labelled parts on the diagrams.

Part	Name
P	
Q	
R	
S	
T	

4. What are some things that could make these changes go faster or slower?

   (i) _____

   (ii) _____

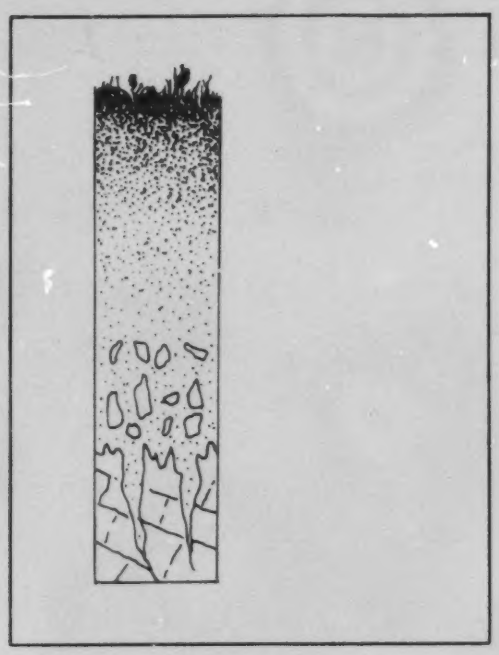
   (iii) _____

   (iv) _____

   (v) _____

The questions on this page refer to this diagram.

1. The diagram shows a soil profile. Clearly label the three horizons in the diagram showing where you think each starts and finishes.



2. What is the main characteristic of each horizon?

(i) _____

(ii) _____

(iii) _____

3. Explain the differences between the A and B horizons in a soil.

_____

_____

_____

4. (i) What does <u>illuvial</u> mean?

_____

_____

(ii) What does <u>eluvial</u> mean?

_____

_____

(iii) Which horizon is the illuvial horizon? _____

(iv) Which horizon is the eluvial horizon? _____

1. In a well-formed soil, it is possible to distinguish A, B and C horizons. Next to the statement below, write the letter A, B or C according to which horizon the statement describes.

Statement 1.	The zone of illuviation. The material here is derived from material from another horizon.	HORIZON _____
Statement 2.	The zone of weathered rock. This zone consists of partly decomposed rock material and grades downwards into unweathered rock.	HORIZON _____
Statement 3.	The zone of eluviation. This is the zone from which most material has been lost in solution or as colloids. It is usually black or dark grey due to humus content.	HORIZON _____

2. What effects do living organisms have on soil formation?

_____

_____

_____

_____

_____

3. (i) Which of the rocks basalt, granite, and sandstone could produce the richest soil?

_____

Explain why

_____

_____

(ii) Soil from which rock would allow water to drain away most rapidly?

_____

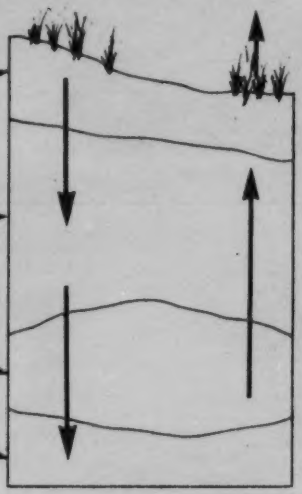
Explain why

_____

_____

The questions on this page refer to the diagram below

1. Identify each part of the diagram.



A. _____

B. _____

C. _____

D. _____

2. In the spaces below, say what each part of the soil is made of.

Part A _____

_____

Part B _____

_____

Part C _____

_____

3. What major process happens in each of these parts?

Part A _____

_____

Part B _____

_____

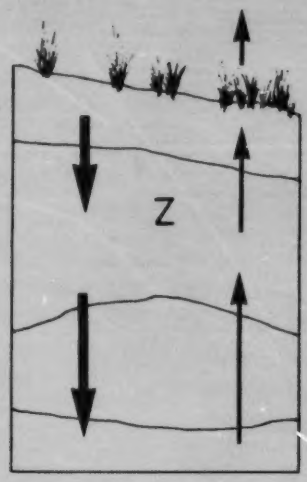
Part C _____

_____

4. What do the arrows represent?

_____

The questions on this page refer to the diagram below.



The arrows show the direction of movement of water through the soil.

1. In what type of climate would you expect water to move.
   (i) downwards _____
   (ii) upwards _____

2. What minerals would you expect to find in horizon Z in a tropical climate?
   _____
   _____

3. What minerals would you expect to find accumulated in the top soil in a very arid climate?
   _____
   _____

4. Explain how minerals move into different horizons in a soil.
   _____
   _____
   _____
   _____

5. What do these words mean as they apply to soils?
   (i) leach _____
   _____
   (ii) accumulate _____
   _____
   (ii) enrich _____
   _____

1. Describe the processes which led to the formation of each horizon in a soil profile.

(i) The A horizon _____

_____

_____

(ii) The B horizon _____

_____

_____

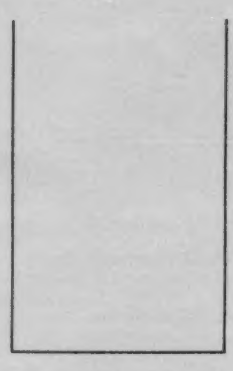
(iii) The C horizon _____

_____

_____

2. Draw a diagram of a typical soil profile and put the following labels on it:

A horizon
B horizon
C horizon
Zone of leaching
Zone of enrichment
Bedrock
Partly decomposed rock
Humus



3. Many things can influence the way soils are formed. Write briefly on the influences of the following:

(i) Climate _____

_____

_____

(ii) Living organisms _____

_____

_____

(iii) Parent material _____

_____

_____

(iv) Topography _____

_____

_____

(v) Time _____

_____

_____

1. What is meant by the following terms:

   (i) Texture of a soil _____

   _____

   (ii) Quality of a soil _____

   _____

   (iii) Clumping _____

   _____

   (iv) Leaching _____

   _____

2. What sort of texture would a good soil have? _____

   _____

   Explain your answer _____

   _____

   _____

   _____

3. Name a rock which would decompose to form:

   (i) A poor quality soil _____

   (ii) A good quality soil _____

4. Some soils clump more than others. Explain why?

   _____

   _____

   _____

5. (i) From which soil horizon does most leaching occur?

   _____

   (ii) Into which horizon does the leached material accumulate?

   _____

   (iii) What is leached? _____

   _____

1. A scientist studied the amount of CO_2 produced in one hour from four different soils. The following results were obtained.

Location of soil	CO_2 produced in grams/sq.metre/hour
Pine tree plantation	3.70
Grassy turf in orchard	8.80
Oak forest	7.75
Birch wood	3.12

State which soil is likely to be most fertile, and explain your choice.

_____

_____

_____

2. In soil food chains, what are the main "producers"?

_____

_____

3. Other soil organisms can be grouped into "decomposers" and "carnivores".

(a) Name 3 groups of animals which contain many "decomposers".

(i) _____

(ii) _____

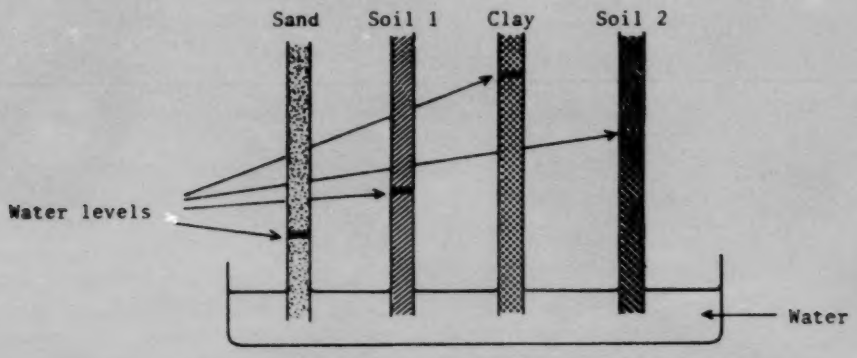
(iii) _____

(b) Name 2 groups which contain many "carnivores".

(i) _____

(ii) _____

The questions on this page refer to the diagram below which shows several glass tubes containing various substances. The bottom of each tube is immersed in water. The height to which the water has risen is also shown.



1. (i) Which of the two soil samples contains the:

   (a) most sand _____

   (b) most clay _____

   (ii) Briefly explain how you decided on these answers.

   _____

   _____

   _____

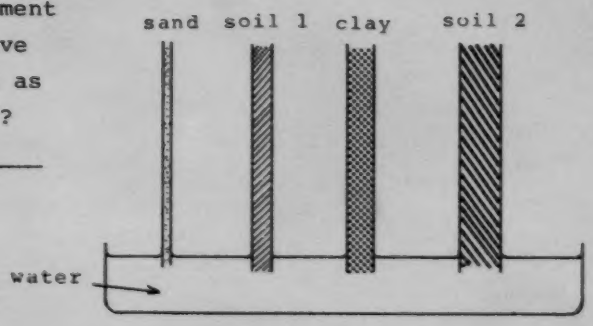
2. What are 2 factors in this experiment which need to be controlled?

   (a) _____

   (b) _____

3. (i) Would the experiment drawn (right) give the same results as that shown above?

   _____



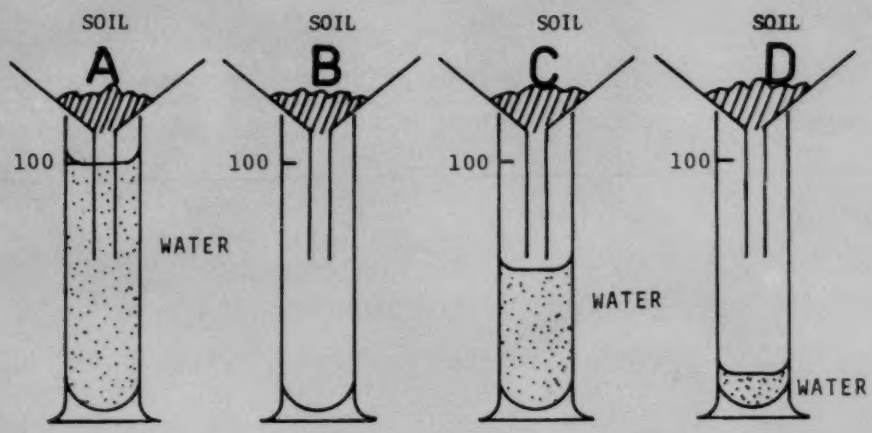
   (ii) Explain your answer.

   _____

   _____

   _____

The questions on this page refer to the diagrams and information below:



50g of four different soils (A, B, C and D) were placed in four separate filter funnels. 100mL of water was poured into each filter funnel, and the water passing through the soil was collected in a measuring cylinder as shown.

1. Put the 4 soils in order of increasing clay content.

Least clay: ☐ ☐ ☐ ☐ : Most clay

2. Which soil would be the most unsuitable for growing of crops? Explain.

_____

_____

3. Estimate the amount of sand and clay in each soil. Give your answers as approximate percentages.

Soil	% Sand	% Clay
A		
B		
C		
D		

4. Present your % composition figures for each soil in the form of a bar graph.

1. What is meant by the "permeability" of soil? How does the structure of a soil affect its permeability?

2. Describe experiments, one for each, (i) to compare the permeabilities of two different soils and (ii) to find the percentage of water in a sample of soil.

3. State two ways in which earthworms affect the condition of a soil.

(i)

(ii)

4. Toadstools and other fungie are very common in damp woodland soil during autumn. Why is this?

5. State three ways in which the soil differs from the surface of the ground as a habitat for animals.

(i)

(ii)

(iii)

1. What are 5 things that are part of soil?
   a) _____
   b) _____
   c) _____
   d) _____
   e) _____

2. Briefly describe the soils which are formed from the weathering of the following rocks:
   (i) granite _____
   (ii) basalt _____
   (iii) sandstone _____

3. Why is it necessary to add fertilizers to some soils?
   _____
   _____

4. In which horizon would you expect to find:
   (i) partly decomposed rock _____
   (ii) the most living organisms _____
   (iii) mineral enriched soil _____
   (iv) the most fertile soil _____
   (v) decaying plant material _____

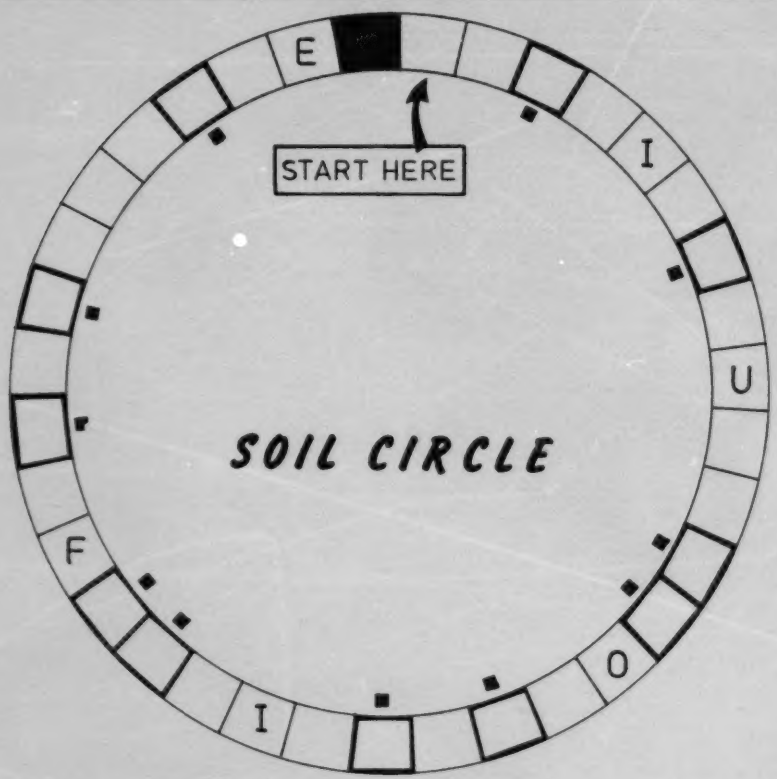
5. Complete these sentences:
   (i) The main product of weathering is _____
   (ii) Two factors which influence the kind of soil which forms in an area are _____ and _____
   (iii) Soil generally contains some dark coloured organic material called _____
   (iv) The various layers in a soil profile are called _____
   (v) What parent rock forms a very sandy infertile soil? _____
   (vi) Fertile red and black soils may be formed from a parent rock like _____
   (vii) Downward movement of soluble materials in a soil is called _____
   (viii) A vertical section through a soil, which shows the layered structure is called _____
   (ix) The ability of a soil to let water pass through it or not depends on the relative amounts of _____ and _____ it contains.

Six words relating to soil fit into the 34 spaces in the diagram below. The first word starts from the position indicated, and the rest follow, in order, clockwise around the circle.

One letter from each word has been given as a clue, but you don't know where each word starts or finishes. You also don't know how many letters are in each word.

Use these clues to find the six words, then write them, in the same order, around the circle.

1. The side view of a soil.
2. Decayed organic matter in the soil.
3. Formed when rocks are changed by physical, chemical, and biological means.
4. Several of these are seen in the side view of a soil.
5. Name given to a very rich and productive soil.
6. Lots of this is needed to form deep soils.



Now, unscramble the letters in the heavier squares (11 of them), to form two words.....

_____ _____.

What is this?

_____

_____

_____

STREAM

The questions on this page refer to the diagrams below.

1. The three diagrams above represent the same stream at three different periods of time. What is the correct order for these diagrams?

   1 2 3

2. On each diagram label (E) where erosion is occuring and (D) where sediment is being deposited.

3. What is structure X _____

4. Describe how this forms _____
   _____
   _____

The questions on this page refer to the diagram below.

1. What is the main feature in this diagram? _____
   _____

2. Briefly describe how this feature might have formed. _____
   _____
   _____
   _____

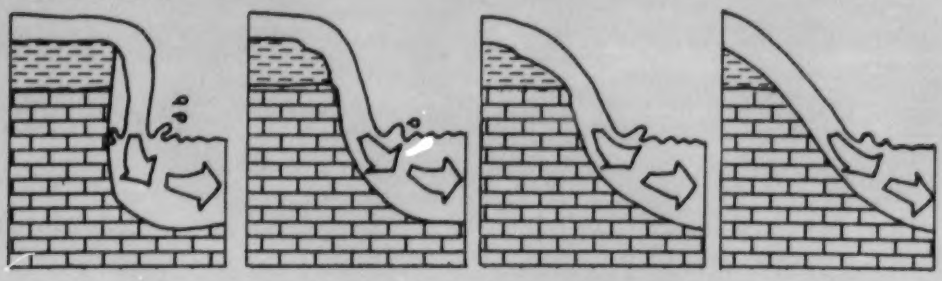
3. Name 3 things which might have contributed or assisted the formation of this feature.
   (i) _____
   (ii) _____
   (iii) _____

4. How might features such as these by avoided?
   (i) _____
   (ii) _____

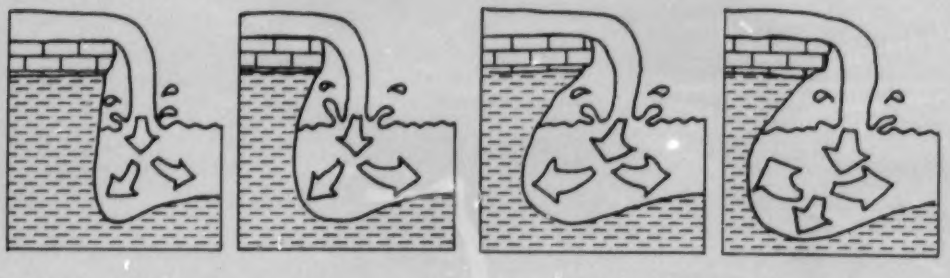
5. Give 2 reasons why the formation of such features is undesirable.
   (i) _____
   (ii) _____

The questions on this page refer to the diagrams below

Waterfall A



Waterfall B



The diagram show stages in the development of two waterfalls.

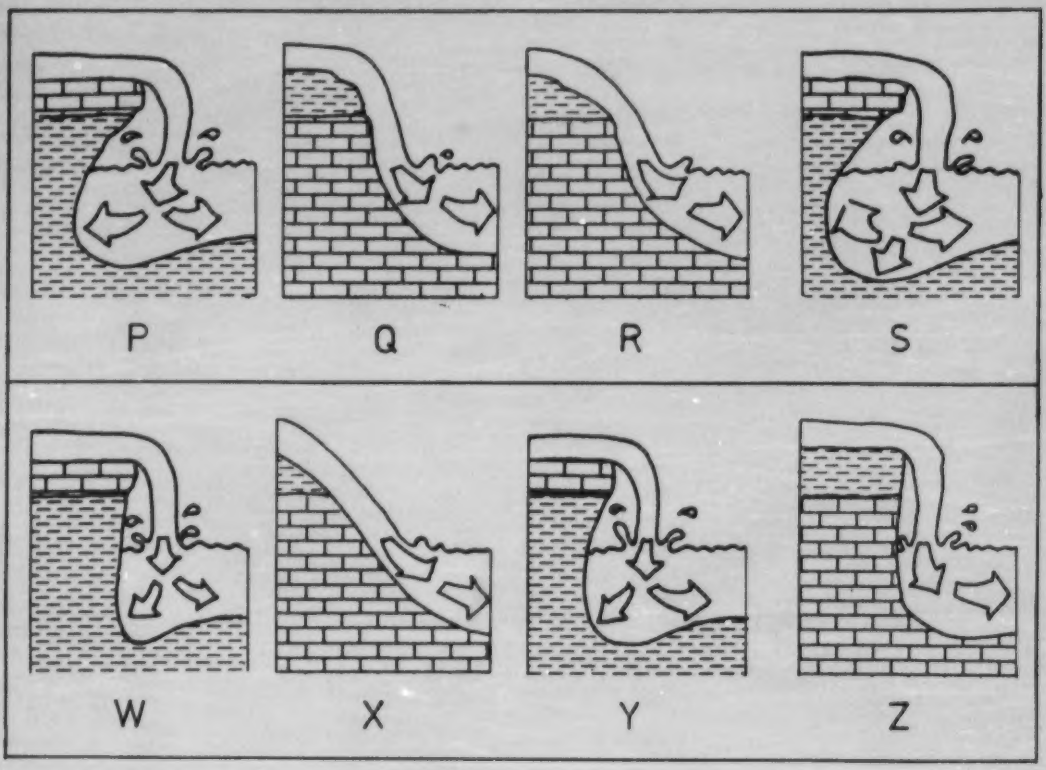
(i) Which rock is more resistant to erosion? _____

(ii) In the spaces below, make sketches of the possible appearances of the waterfalls after further erosion has occured in each.

Waterfall A

Waterfall B

The questions on this page refer to these diagrams:-



1. The diagram show stages in the development of 2 waterfalls. However, the diagrams are out of order and jumbled up. What is the correct order of the diagrams for each of the waterfalls?

	Correct order of Diagrams			
Waterfall 1				
Waterfall 2				

2. What conclusion can you make about the two different rock types shown in these diagrams?

_____

_____

3.

(i) Which rock type would be better to use to build a wall or a house? _____

(ii) Why? _____

A student wrote the following table showing where each of the features are found along the course of a river. Unfortunately, he was a little mixed-up and made quite a few mistakes.

1. Correct his mistakes in the blank table below by writing all the features in the correct columns.

Mountain Tract	Middle Tract	Coastal Tract
meanders	swamps	rapids
lagoons	sand spits	levee banks
river terraces	deltas	waterfalls
sand dunes	flood plains	alluvial fans
pot holes	overlapping spurs	billabongs
estuaries	U shaped valleys	V shaped valleys
sand bars		playa lakes

Fill in this table correctly.

Mountain Tract	Middle Tract	Coastal Tract

1. What effect does the shape of a river channel have on the water flowing through it?

_____

_____

_____

2. Name 4 methods by which a stream erodes its channel.

(i) _____

(ii) _____

(iii) _____

(iv) _____

3. Briefly describe each of the methods listed in the question above.

(i) _____

_____

(ii) _____

_____

(iii) _____

_____

4. What is a braided stream?

_____

_____

5. How is a braided stream formed?

_____

_____

_____

6. The course of a river can be divided into three parts

1. *Mountain* (or headwater tract)?
2. *Middle* tract.
3. *Coastal* tract.

State in which part of the river the following features are found

(i) 'V' shaped valleys _____

(ii) Meanders _____

(iii) River delta _____

(iv) Rapids _____

(v) Billabongs _____

(vi) Overlapping Spurs _____

(vii) Levee Banks _____

(viii) Lagoons _____

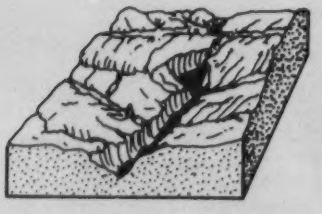
(ix) Pot holes _____

(x) River terraces _____

The questions on this page refer to the diagrams below

A

B



C

D

1. Which of the landscapes above has been most eroded _____

2. Give two reasons to support your answer

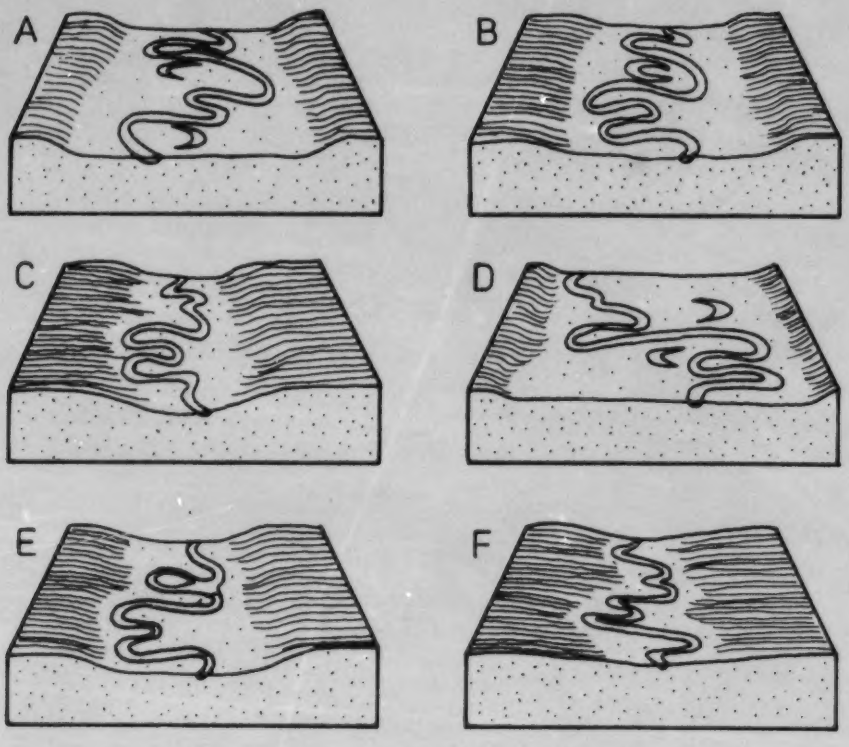
   (i) _____

   (ii) _____

3. For each of the river landscapes above state whether erosion or deposition is the main process occuring, giving evidence from the diagrams to support your statements.

Diagram	Mainly erosion or deposition	Evidence
A		
B		
C		
D		

The questions on this page refer to these diagrams.



The diagram represent stages of development in a river valley. They have been jumpled up.

1. What is the correct order of development of the river valley?

earliest							most recent

2. Place these following labels on the diagrams (place each once only). meander, valley floor, valley walls, billabong.

3. If the river is flowing from top to bottom of each diagram, label one spot (E)where erosion is occuring and one spot (D) where sediment is being deposited.

4. Briefly explain your choices for (E) and (D).

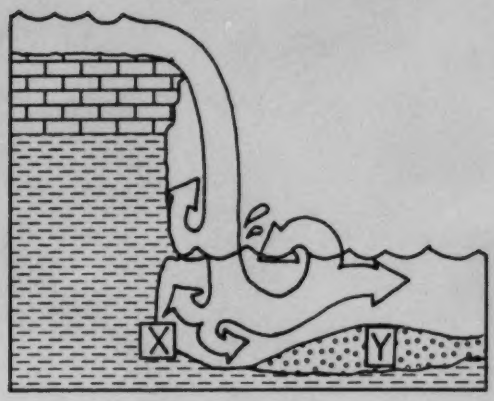
_____

_____

_____

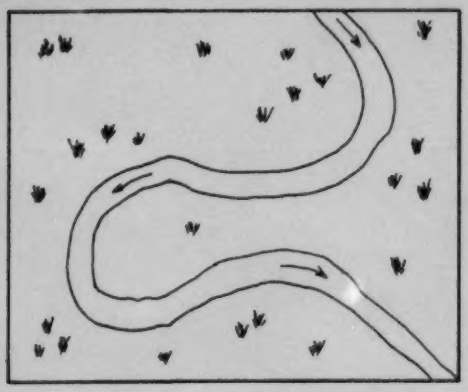
_____

The questions on this page refer to the diagram (right).



1. What is the main feature shown in the diagram? _____
2. What do the arrows in the diagram represent? _____
_____
3. Name the feature labelled 'X'. _____
4. How is X formed? _____
_____
5. What is this process called? _____
6. Explain why deposition of coarse sediment (Y) occurs just down stream from X. _____
_____
_____
_____
7. What is "coarse sediment"? _____
_____
_____
8. What is the opposite of "coarse sediment"? _____
_____
9. Draw a diagram to show what this area might look like after more erosion has occurred.

The diagram below shows part of a river. In the space next to the diagram draw another diagram to show how this part of the river will probably appear in the future.



What is the name of the feature you have drawn? _____

Describe how this feature formed.

_____

_____

_____

1. Describe the erosion and deposition occurring in each of the following parts of a river.

(i) Mountain tract.

_____

_____

_____

(ii) Middle tract.

_____

_____

_____

(iii) Coastal tract.

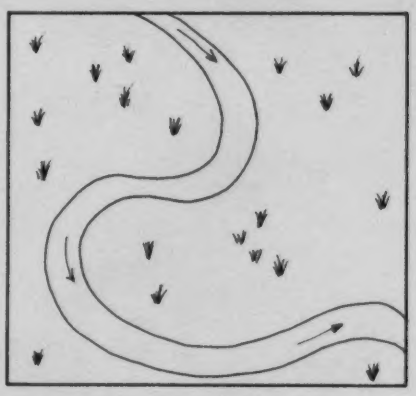
_____

_____

_____

2. The next question refers to the diagram (right) The diagram shows part of a meandering stream.

On the diagram label
(a) Two places where erosion occurs (E)
(b) Two places where deposition occurs (D)



3. Explain why erosion occurs in the regions you have marked (E) on the diagram above.

_____

_____

_____

_____

4. Explain why deposision occurs in the regions you have marked (D) on the diagram above.

_____

_____

_____

_____

The silting up of river mouths is dangerous to boats trying to enter and leave rivers. Huge sums of money are spent each year dredging these areas to keep the river channels clear for shipping.

When these rivers were first settled, there was little farming and forestry upstream and the problem was not as severe.

1. What changes did settlers make to the environment upstream?

2. How did these changes increase the amount of sediment in the rivers?

3. You are given the job of reducing the silt build-up at a river mouth. You divide your efforts into:-

   A. Reducing the amount of sediment entering the river and

   B. measuring the effectiveness of your efforts.

      (i) Suggest a method for (A), and explain how it would reduce the sediment entering the river.

      (ii) Suggest a method for measuring the amount of sediment carried by a river.

1. Explain the meaning of these terms:

Transport: _____

_____

Rolling: _____

_____

Saltation: _____

_____

Solution: _____

_____

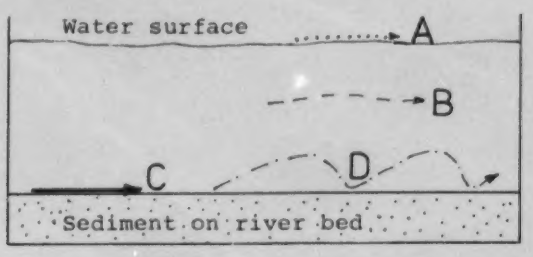
Suspension: _____

_____

2. The materials at the left (below) are all being transported by a river in its mature tract.
Select from the column on the right the most appropriate method by which these materials would be transported.

Materials		Method of Transport
A.	Chloride salts _____	1. Rolling
B.	Clay _____	2. Saltation
C.	Gravel _____	3. Solution
D.	Pebbles _____	4. Suspension
E.	Sand _____	
F.	Silt _____	

1. (a) Flotation, suspension, saltation and traction are methods by which materials are carried in a river. The diagram below is a section along a river and the letters A, B, C and D refer to the paths taken by different particles.



In the following table indicate the method of transport for each particle.

Particle	Method of Transport
A	
B	
C	
D	

(b) Another method of transport is solution. What type of material would be carried in solution?

_____

2. Describe the influence of river transport on:

(a) particle size _____

_____

(b) particle shape _____

_____

3. What can you say about the velocity of a stream which deposited:

(a) pebbles _____

(b) sand _____

(c) mud _____

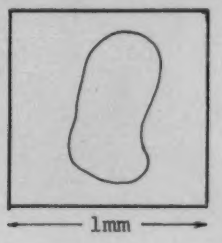
4. Explain the process by which sand bars form in a river delta?

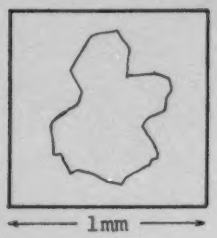
_____

_____

_____

The questions on this page refer to these diagrams:





The diagrams show two grains of quartz sediment. They were taken from different points in the same river.

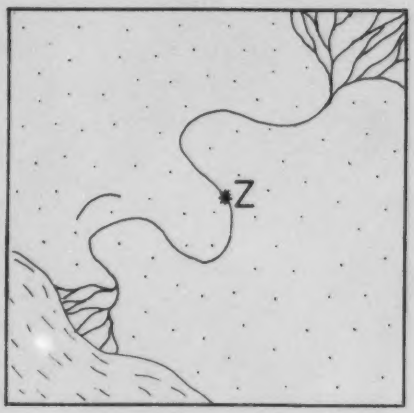
1. Which has undergone most transport? _____

2. Explain the reason for your choice in question 1.

_____

_____

3. Mark on the diagram of the river (right) a possible point in the river from which each particle might have been taken. Mark X particle X and Y for particle Y.

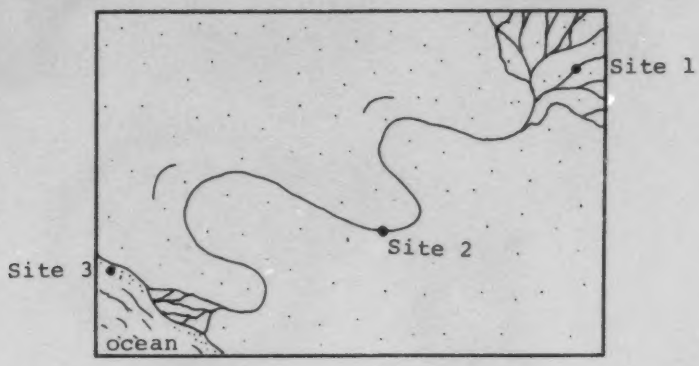


4. Marked on the diagram is point Z. Draw a diagram of the particle you would expect to find at Z.

5. Would these particles be pebbles, rocks, sand or clay particles?

_____

The questions on this page refer to the map below:



1. What is meant by the phrase "sorting of the sediment"?

_____

_____

2. Describe the sorting of the sediment at the sites marked on the map. Use the terms: poorly sorted, well sorted, very well sorted.

Site 1 _____

Site 2 _____

Site 3 _____

3. Explain how "sorting of sediment" happens?

_____

_____

_____

_____

4. Now explain your answers to question 2.

_____

_____

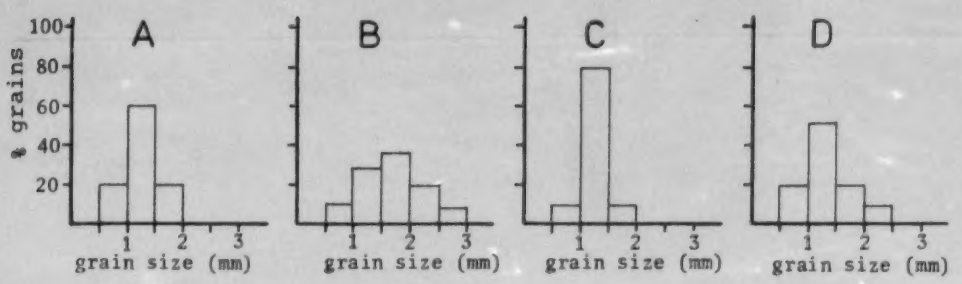
_____

_____

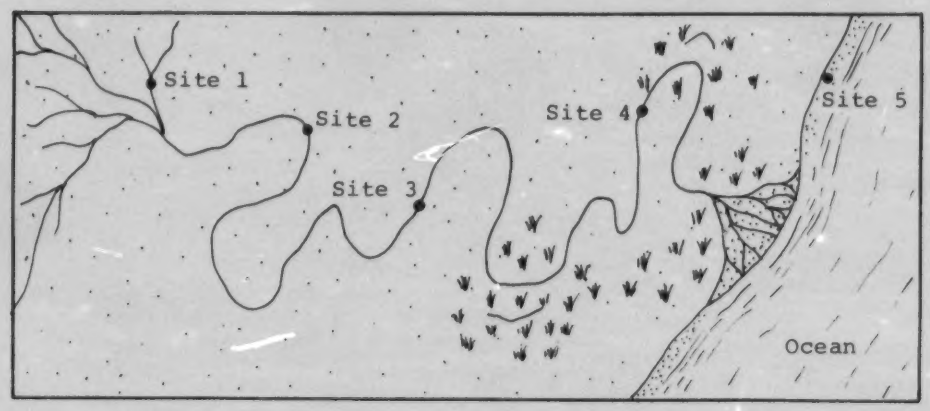
_____

5. In the spaces below, draw diagrams to show the appearance of the sediment you would expect to find at the 3 sites on the map.

The questions on this page refer to the histograms below.



The histograms above represent the distribution of grain sizes of sediment taken from the sites marked on the map below.



1. The sediment in histogram A comes from site _____
   The sediment in histogram B comes from site _____
   The sediment in histogram C comes from site _____
   The sediment in histogram D comes from site _____

2. Explain why you chose your answer for site 5.

   _____
   _____
   _____

3. How does the histogram you chose for site 5 differ from the one you chose for site 1.

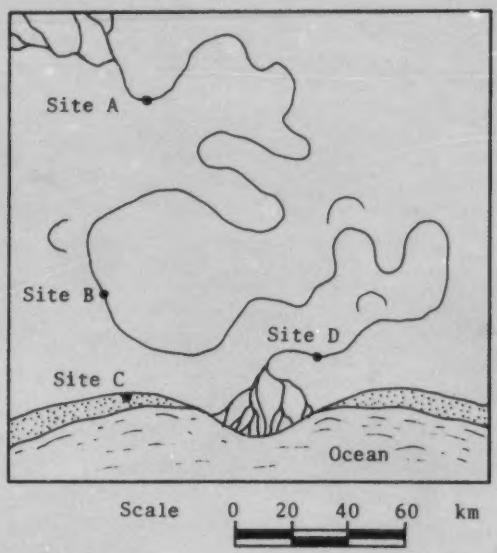
   _____
   _____
   _____
   _____

4. If you were asked to draw the histogram for site 3, how would you practically determine the various size distributions of sediment.

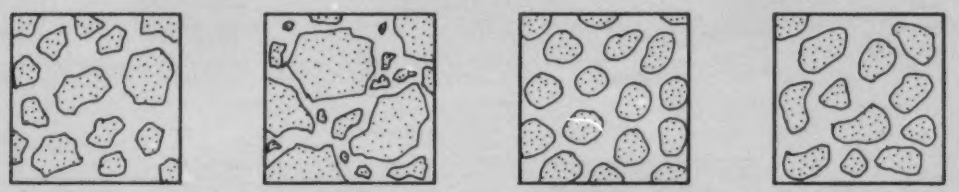
   _____
   _____

The questions on this page refer to the diagram and information below:

- Samples of sediment were taken from the sites indicated on the map.
- Unfortunately, the collector forgot to label each sample.
- However, he made accurate diagrams of each sample, all to the same scale. These diagrams are reproduced below.



Diagrams of Samples



Q.1 From which site was each sample taken?

- Sample 1 is from site _____
- Sample 2 is from site _____
- Sample 3 is from site _____
- Sample 4 is from site _____

Q2. Explain why you made the choices you did in answering question 1.

_____

_____

_____

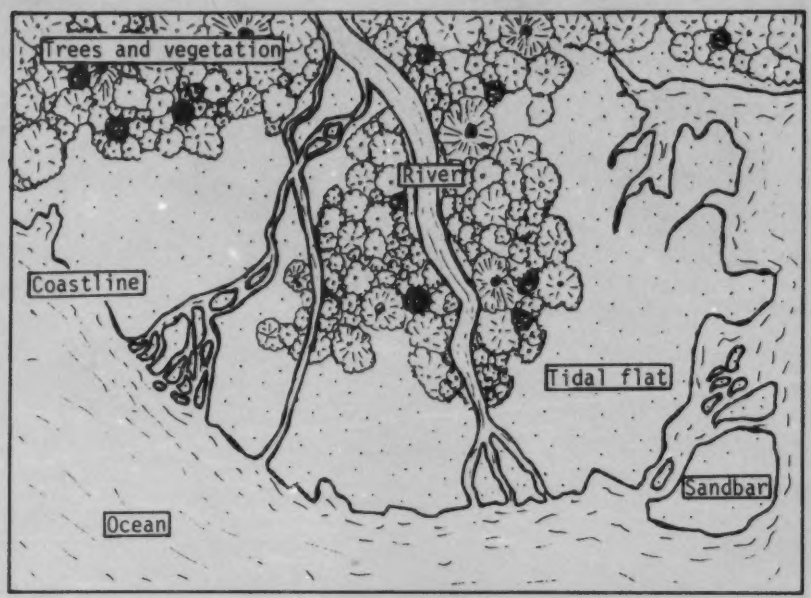
_____

Q3. What is the name of the process which changes the shape of the particles in the sediments? _____

Q4. What is the name of the process which describes the shifting of particles of sediment from one place to another?

_____

The questions on this page refer to the diagram below which shows an area where a river meets the ocean.



1. The structure drawn is called a _____

2. What is the tidal flat made up of? _____
_____

3. Explain why a river deposits its load like this.
_____
_____
_____

4. (i) As the river approaches the ocean, the main river channel splits up into a number of smaller channels. This forms a _____ stream pattern.
(ii) Explain why this pattern forms.
_____
_____
_____
_____

5. How did the sand bar form?
_____
_____
_____

CLUES ACROSS

1. The name given to lower courses of rivers where the tide ebbs and flows.

2. The process whereby a stream loosens and removes bedrock.

3. The process by which sand moves along the stream bed.

4. The major grain size carried in the bed load of a river in its mature tract.

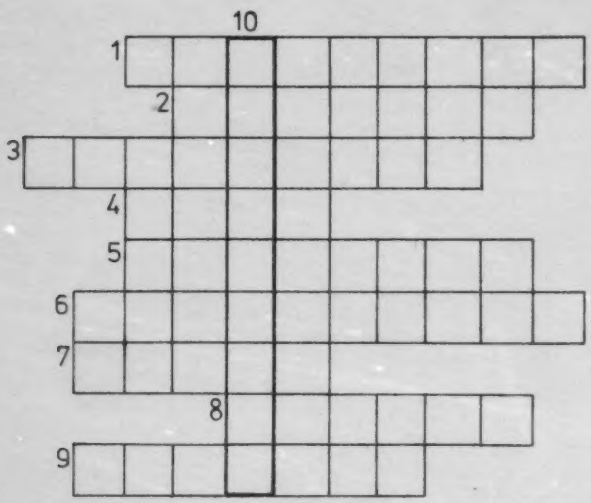
5. The shape of valleys formed by streams.

6. Clay and silt are carried by a stream in _____

7. A billabong is a(n) _____ lake.

8. A section of a stream where an increase in gradient causes a marked increase in velocity.

9. The process by which sediments come to be of uniform grainsize.



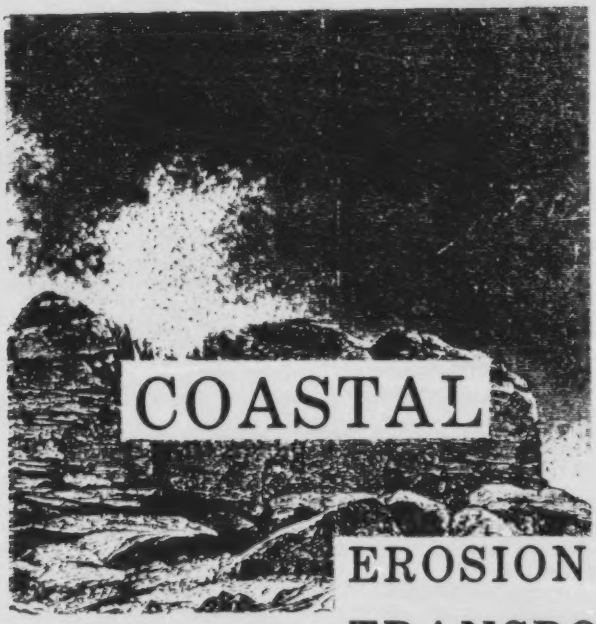
What is 10 Down? _____

Make up a clue for it.

_____

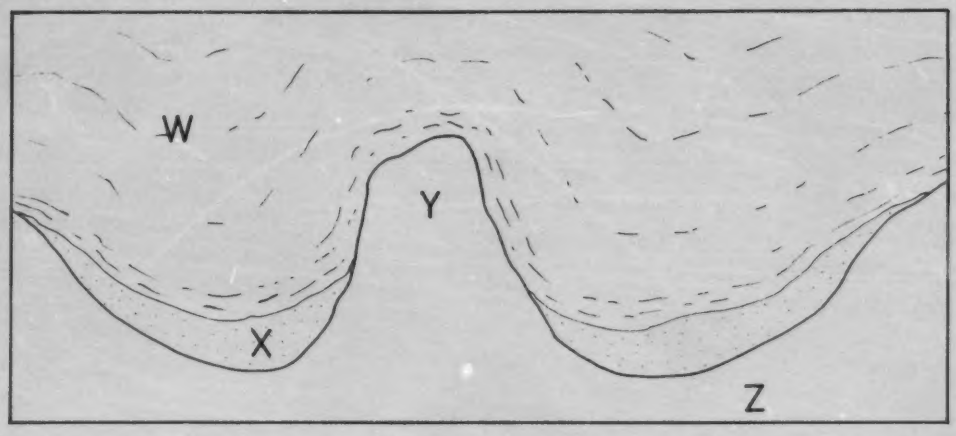
_____

_____



EROSION
TRANSPORT
DEPOSITION

The questions on this page refer to this diagram which shows part of a coastline.



1. Complete the table by identifying each feature in the diagram.

Feature	Name of feature
W	
X	
Y	
Z	

2. Re-draw the diagram to show the same area after many years of erosion. Label at least one <u>new</u> feature which could form as a result of this erosion.

3. What is a tied island? _____

_____

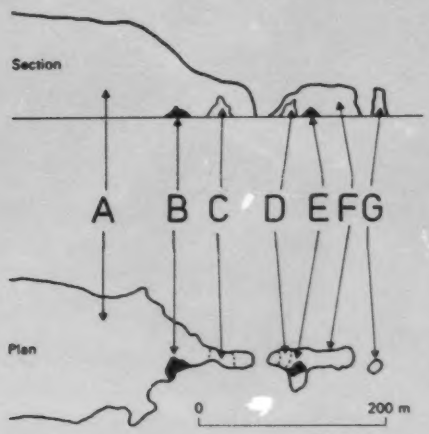
4. How could this area produce a tied island?

_____

_____

_____

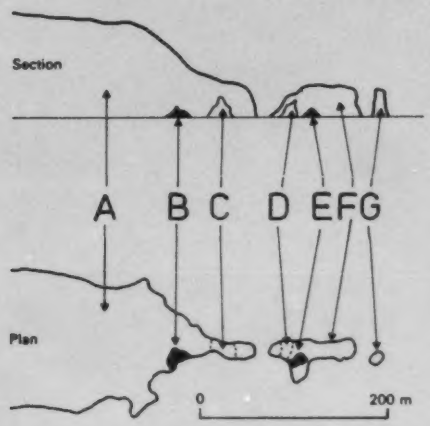
The next question refers to the diagrams below. The diagrams show a section and a plan view of the same headland.



Identify each labelled feature on the diagram.

Feature	Name of feature
A	
B	
C	
D	
E	
F	
G	

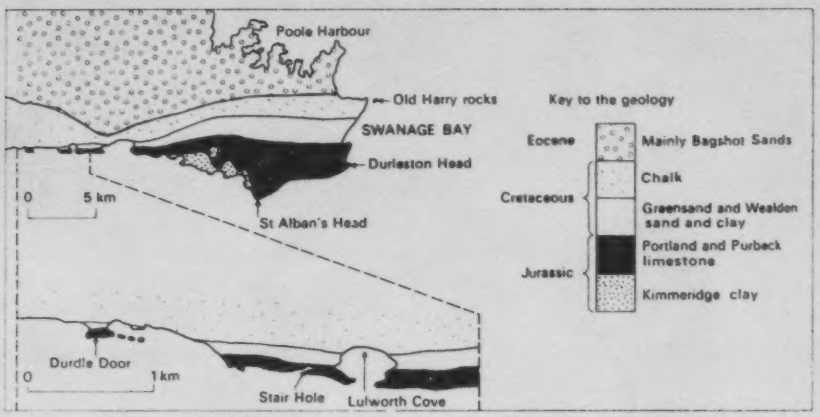
The next question refers to the diagrams below. The diagrams show a section and a plan view of the same coastal feature.



Match each labelled feature with its correct names. Some names will need to be used more than once.

Feature	Name of Feature	Choose from
A		arch
B		cave
C		headland
D		stack
E		
F		
G		

The next question refers to the diagram below. The diagram shows a plan view of a section of a coastline. Notice that one section of the coastline (within the dotted frame) has been enlarged so as to show more detail.



Use the information shown in the map to list the 5 rock types in order of resistance to coastal erosion.

Most resistant
1. _____
2. _____
3. _____
4. _____
Least resistant
5. _____

The questions on this page refer to this diagram which shows a series of waves approaching a coastline.

1. Choose the correct statement or word from those on the right-hand side and write it in the space provided.

(i) Waves are transporters of _____

(ii) Around the headlands, the wave fronts are being _____

(iii) The bending of the waves around the headland is caused by _____

(iv) The energy of the wave is related to its _____

1. change in depth
2. amplitude
3. energy
4. reflected
5. refracted
6. reflection
7. refraction

2. The diagram shows the erosion of a coastline.

(i) Describe how the headlands are being weathered.

_____

_____

_____

(ii) What part does water play in moving the sediments?

_____

_____

_____

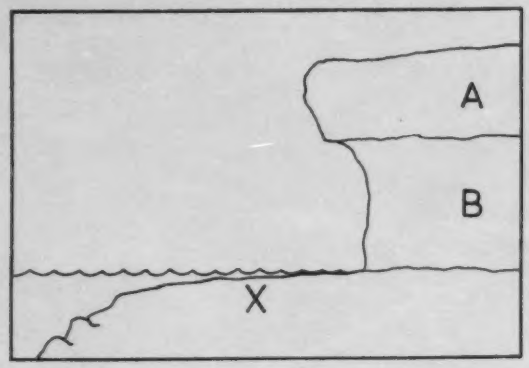
(iii) How is the sand deposited on the beach?

_____

_____

_____

The questions on this page refer to this diagram:



1. Name structure X _____

2. Explain how structure X has been formed.

_____

_____

_____

_____

3. Look at the cliff. What could you say about rock A compared to rock B?

_____

4. Explain briefly why the cliff is the shape it is.

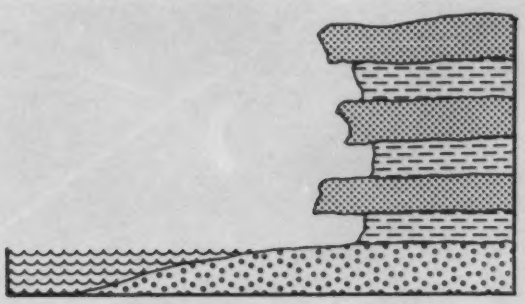
_____

_____

_____

5. Draw a diagram to show the shape of the cliff, and what might happen to rocks A and B as weathering continues.

The questions on this page refer to this diagram.



1. What agent of weathering caused this formation?

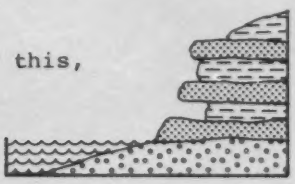
2. Briefly explain how this feature might have formed.

3. Where, in general, would you expect to find structures like this?

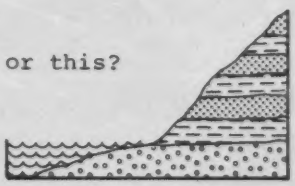
4. Where, in Australia, would you expect to find structures like this?

5. Why does this structure have the particular shape shown above, rather than looking like:

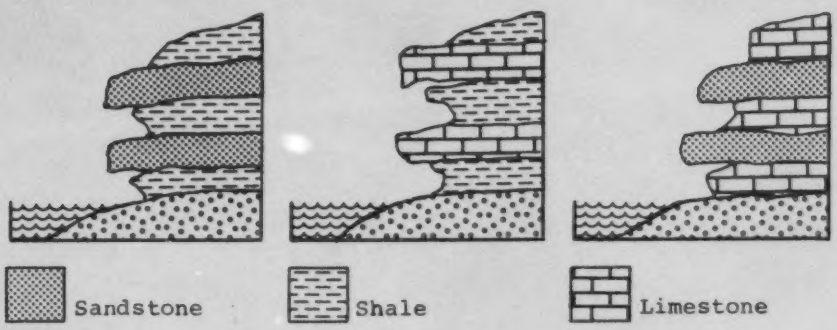
this,



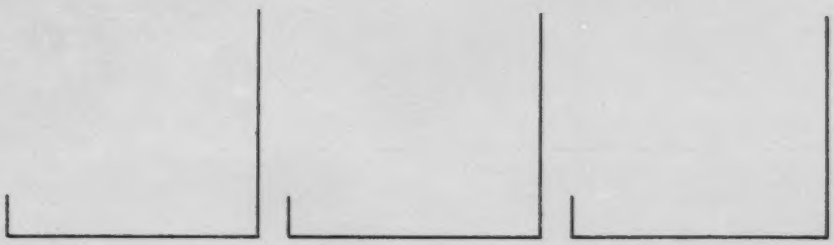
or this?



The questions on this page refer to these diagrams.



1. Draw diagrams to show the shapes of the cliffs after a long period of weathering and erosion.



2. Briefly explain the <u>main</u> <u>reason</u> for the shapes you have drawn.

_____

_____

_____

3. Which rock is most resistant to the processes of weathering?

_____

4. Why?

_____

_____

5. Which rock is least resistant to the processes of weathering?

_____

6. Why?

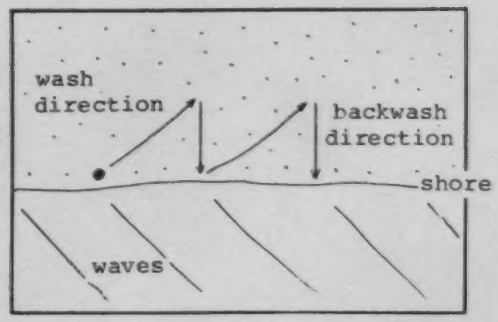
_____

_____

The next 6 questions refer to this diagram.

Which shows how individual sand grains move sideways along a beach as waves break along the coast at an angle.

The sand grains are washed up the beach at an angle, and then return in the backwash.



1. What is this process called? _____

2. What is the meaning of
   (a) *wash* _____
   (b) *backwash* _____

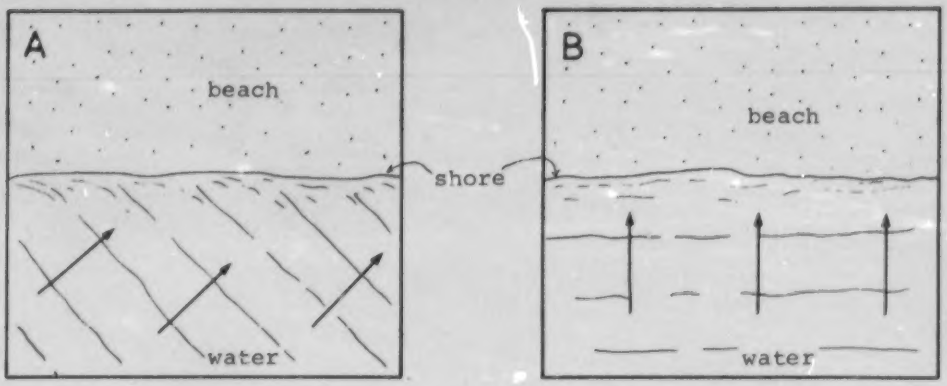
3. Why do the sand grains go up the beach at an angle?
   _____
   _____

4. What causes the waves to break along the shore at an angle?
   _____
   _____

5. Place an arrow on the diagram to show the wind direction.

6. If this process described at the top of the page was occurring along a beach where a river flowed into the ocean, what would you expect to happen at the mouth of the river? Explain.
   _____
   _____
   _____
   _____
   _____

The questions on this page refer to the diagram below. Each diagram shows a shoreline and some waves. The arrows show the direction the waves are travelling.



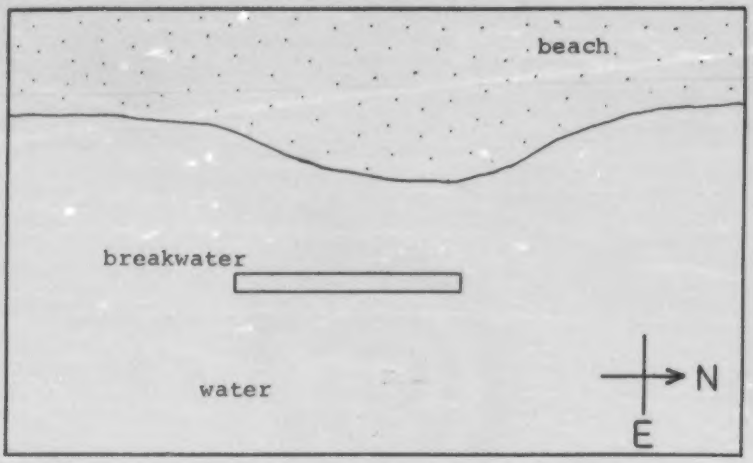
1. On each diagram draw arrows to show
   (a) The direction in which sand particles would move as the waves break on the shore. Label these W.
   (b) The direction the sand particles would move as the waves "backwash". Label these B.W.

2. (a) Are your W directions the same or different? _____
   (b) Explain why:
   _____
   _____
   _____

3. (a) Are your BW directions the same or different? _____
   (b) Explain why:
   _____
   _____
   _____

4. Explain what might happen to the sand on each beach over a long period of time.
   A _____
   _____
   B _____
   _____

The questions on this page refer to this diagram which shows a section of a beach and a breakwater.



1. Draw an arrow on the diagram to show the direction the waves are moving.

2. From which direction is the wind blowing? _____

3. Explain how the bulge has formed behind the breakwater.

_____

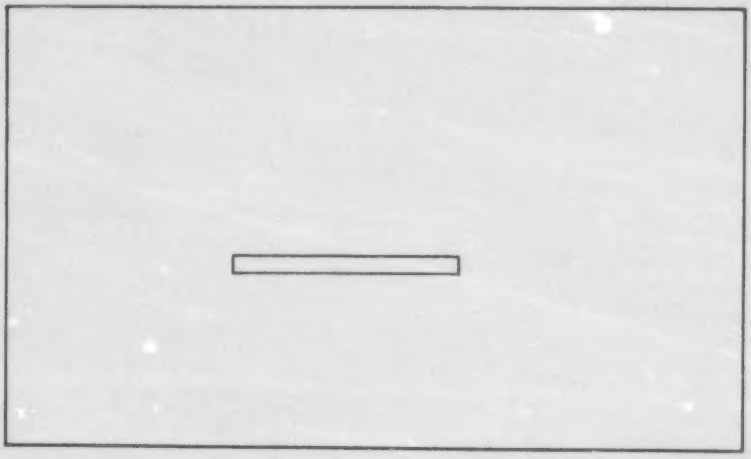
_____

_____

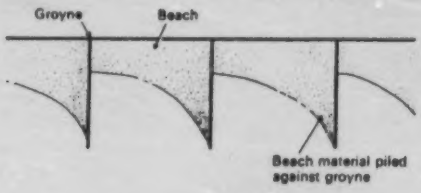
_____

_____

4. Draw a diagram to show what the sand bulge will look like after more sand has been deposited.



The next three questions refer to the diagram below:



1. Indicate on the diagram ,with an arrow, the direction of the longshore drift. (arrow L)

2. Indicate on the diagram the direction of the prevailing wind. (arrow W)

3. Explain why the sand has piled up on one side of each groyne.

_____

_____

_____

_____

_____

1. A student finds a deposit of a fine grained black mineral on a beach.

   (i) What is the mineral most likely to be?

   _____

   (ii) How was this mineral concentrated there?

   _____

   _____

   _____

   _____

   _____

2. The velocity of waves washing up on a beach is greater than the velocity of the backwash.

   (i) Will the wave carry larger grain size sediment during its wash or its backwash? _____

   (ii) If the velocity of a wave during its wash is just great enough to carry a heavy particle, what will happen to this particle during the backwash?

   _____

   (iii) Name three minerals that are concentrated into economic deposits on the N.S.W. coast by this process.

   1. _____
   2. _____
   3. _____

3. (i) Beach sand mining of these minerals on the N.S.W. coast is a very controversial issue. Why do some people object to sand mining? _____

   _____

   _____

   _____

   _____

   _____

   (ii) Name one place where beach sand mining is presently being carried out. _____

   (iii) Describe the process used by the mining companies to "reclaim" the area after beach mining has occurred.

   _____

   _____

   _____

   _____

   _____

   (iv) What does "reclaim" mean as it is used in part (iii) above? _____

   _____

   _____

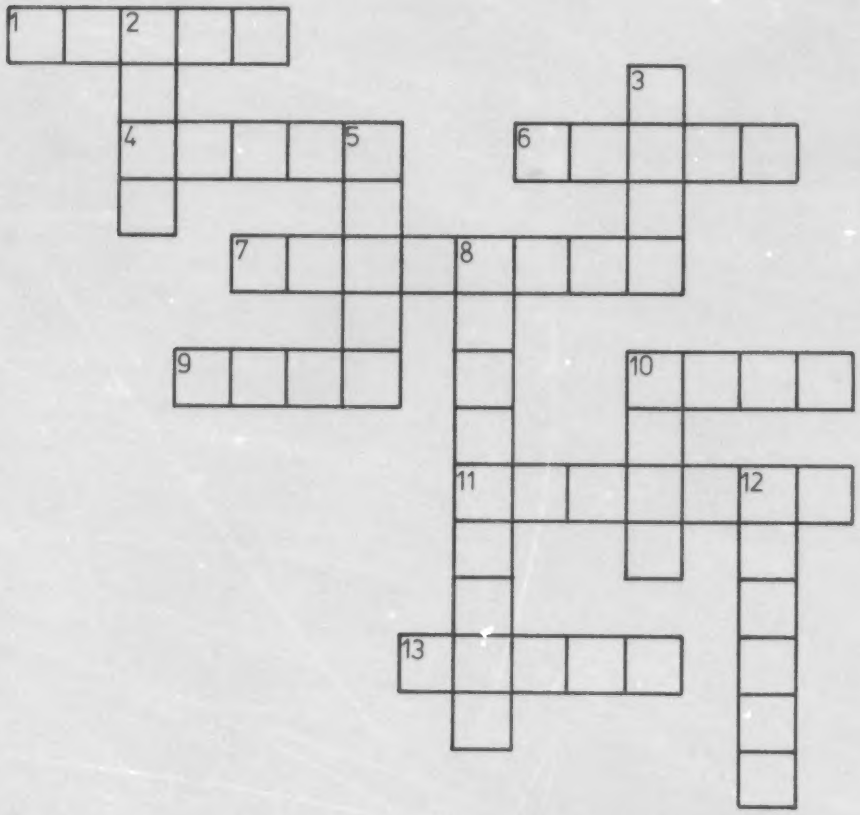
Answer the following questions to complete the crossword below.

ACROSS

1. A sandy shore.
4. Formed where waves undercut the sides of a headland.
6. A steep (or vertical) shoreline.
7. A projection of the land into the sea.
9. The end of a spit where it turns towards the shore.
10. A narrow shoal built up by longshore drift.
11. If no sand is available, beaches may be formed of this.
13. longshore _____

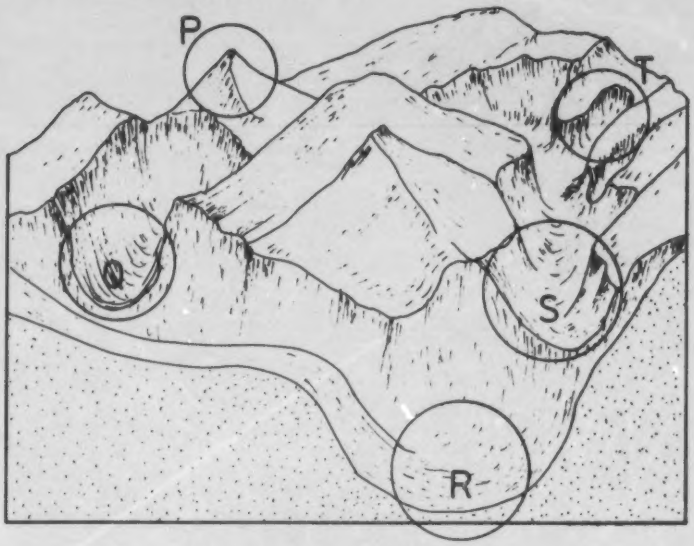
DOWN

2. When caves formed on either side of a headland meet, a(n) _____ is formed.
3. An island which is connected to the shore by sand is called a(n)_____ island.
5. When an arch collapses, a(n) _____ is formed.
8. _____ drift.
10. The material most beaches are formed from.
12. A body of water with a restricted connection to the sea.



GLACIAL
EROSION
TRANSPORT
DEPOSITION

The questions on this page refer to this diagram:-



1. In what sort of region would you expect to find an area like the one drawn above? _____

2. What has been the main factor in the formation of this landform?

_____

3. Name 3 parts of the world where you would find landforms like this. Be as specific as you can (for example - "Australia" is not good enough).

(i)_____

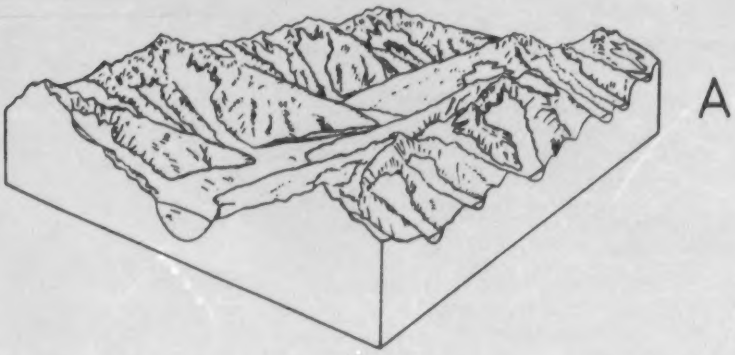
(ii)_____

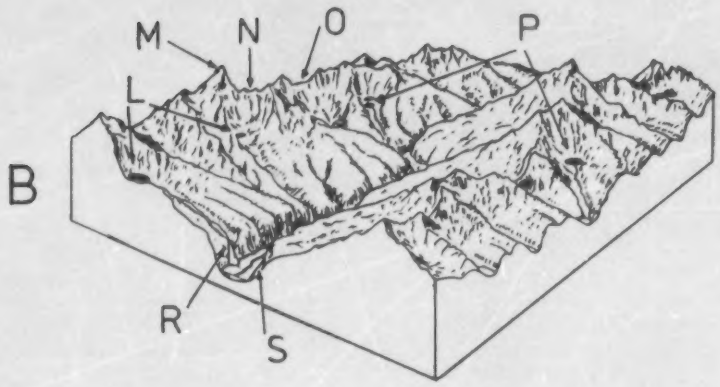
(iii)_____

4. Name the features labelled on the diagram.

Feature	Name of feature
P	
Q	
R	
S	
T	

Diagram A represents a landscape undergoing glaciation. Diagram B represents the same landscape after the glacier has completely melted away.





Certain features on diagram B are marked with the letters L,M,N,O,P. Select the correct terms from those provided at right below and write it in the spares provided next to each letter. (NB-any term can be used more than once).

L _____

M _____

N _____

O _____

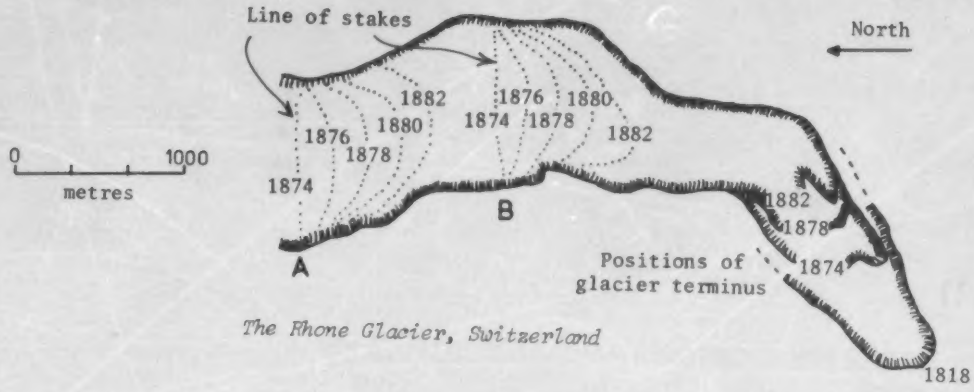
P _____

R _____

S _____

Arete
Col
Cirque
Hanging Valley
Horn
U-shaped valley

The questions on this page refers to this map of Rhone Glacier in Switzerland.



The Rhone Glacier, Switzerland

Two lines of stakes were set up across the glacier in 1874 at positions A and B shown on the map. The positions of the stakes were recorded every 2 years until 1882.

1. Which region of the glacier has moved the faster, the middle or the sides? _____

2. How can you tell? _____

_____

3. Suggest an explanation for this movement.

_____

_____

_____

4. What was the average rate of flow of the middle of the glacier between 1874 and 1882 in metres per year?

_____

5. The position of the snout of the glacier was recorded in 1818, and at irregular intervals till 1882.

   Is the glacier advancing or retreating? _____

6. What would be four possible causes for this change.

   (i) _____

   (ii) _____

   (iii) _____

   (iv) _____

7. What was the average rate of advance/retreat of the snout of the glacier between

   (i) 1818 and 1874? _____

   (ii) 1874 and 1882? _____

1. Explain how a glacier transports its load. _____

_____

_____

_____

2. Material deposited by a glacier is called _____

3. Explain why the material deposited by a glacier is angular in shape. _____

_____

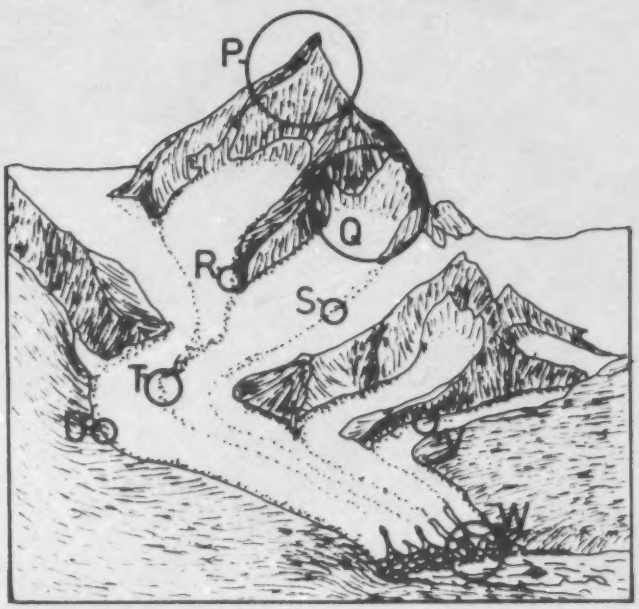
_____

4. Give 2 features of sediment deposited by a glacier:

(i) _____

(ii) _____

5. This question refers to the diagram below:



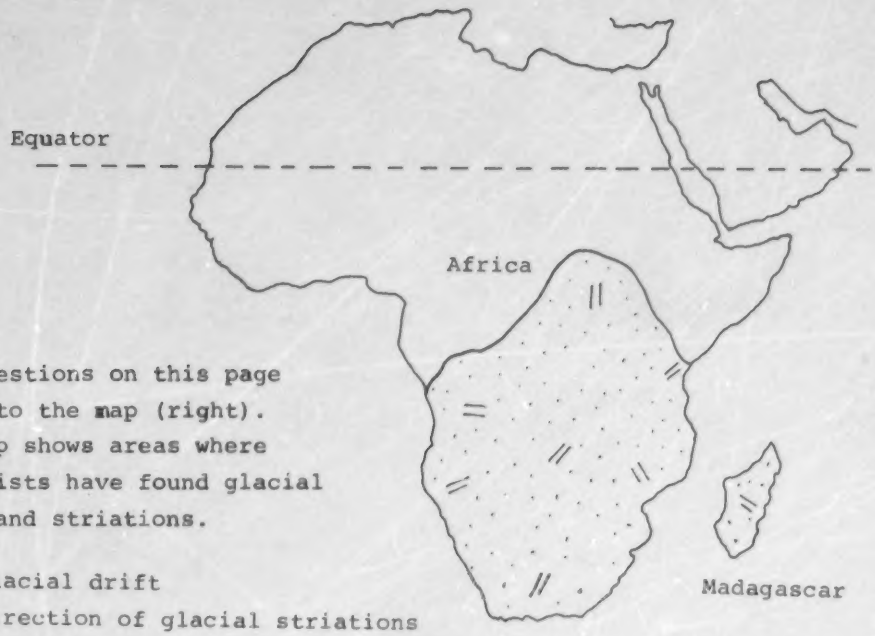
Identify each of the labelled features on the diagram.

P _____ T _____

Q _____ U _____

R _____ V _____

S _____ W _____



The questions on this page refer to the map (right). The map shows areas where geologists have found glacial drift and striations.

glacial drift

= direction of glacial striations

1. The glaciers all started in the same area. Put an "x" on the diagram where you think this was.

2. Show on the diagram the most northerly extent of the glaciers.

3. What information did you use to answer Q(2)?

_____

4. Draw arrows on the diagram to show directions in which individual glaciers most probably moved.

5. Explain why you think they moved in the directions you have shown.

_____

_____

6. How would you explain the presence of glacial drift and striations on the island of Madagascar.

_____

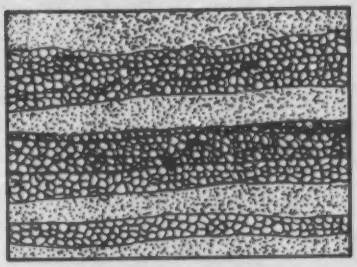
_____

7. Note how close the equator is to the glacial drift. Explain how glaciers have extended into an area which should be too hot for glaciers.

_____

_____

The next 4 questions refer to the diagram (right). The diagram shows a magnified picture of a piece of shale which was formed in a lake fed by a glacial stream.



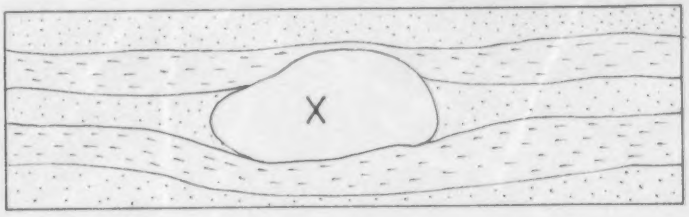
1. What two sedimentary structures are shown in the diagram?
   (i) _____
   (ii) _____

2. A shale like this is called a _____ shale.

3. (i) In what season will there be most melt-water runoff from the glacier? _____
   (ii) In what season will the stream be capable of carrying the largest grain sizes into the lake? _____
   (iii) In which season was X deposited? _____
   (iv) In which season was Y deposited? _____

4. (i) Over what period of time (in years) was the sample of shale deposited? _____
   (ii) Explain how you got your answer to 4(i). _____
   _____
   _____
   _____
   _____

5. Study the cross section below:



Explain how the large boulder marked X may have been transported into an environment where shale is being deposited.

_____
_____
_____

As a glacier carves its valley it may produce very characteristic features on the bedrock over which it passes.

1. The bedrock may have a number of parallel grooves called _____

2. Describe how the parallel grooves form. _____
_____
_____

3. In which direction(s) would these grooves lie? _____
_____
_____

4. What is the name given to:
(i) sediment deposited at the tip of a glacier?
_____
(ii) sediment deposited at the sides of a glacier?
_____

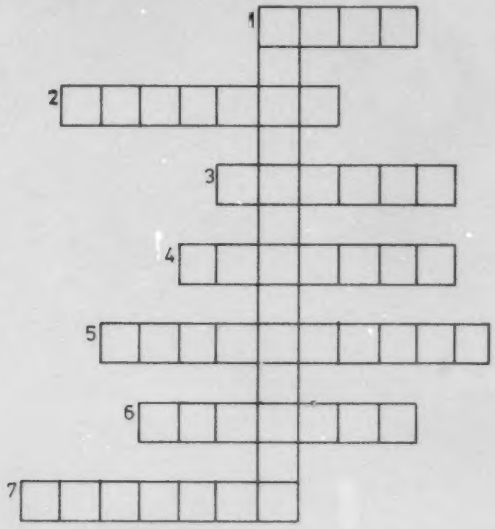
5. Describe two ways in which glacial sediments differ from those deposited by rivers.
(i) _____
(ii) _____

6. Name 2 rocks which can be formed when glacial sediments are turned into rock:
(i) _____
(ii) _____

7. Describe the appearance of each rock.
(i) _____
_____
_____
(ii) _____
_____
_____

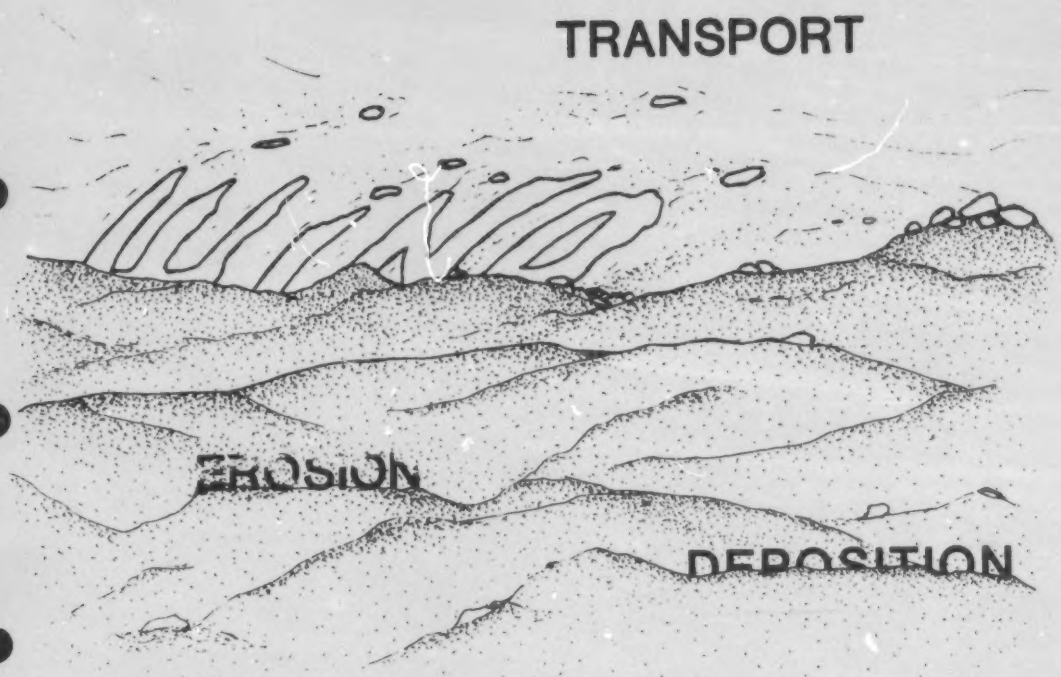
Write the answers to the next 7 questions on the appropriate space in the word puzzle.

1 ACROSS A feature formed when the head of more than two glaciers meet.
2 ACROSS Deposited material.
3 ACROSS The head of a glacier.
4 ACROSS The shape of ice transported material.
5 ACROSS Left on the bedrock after a glacier has passed over.
6 ACROSS Rock formed from glacial depositions.
7 ACROSS The study of the earth.



What is 1 down? _____

_____


TRANSPORT
EROSION
DEPOSITION

WIND EROSION

Answer the following questions in the spaces provided.

i. Sand dunes, both along a beach or inland in desert areas, slowly move forward over grass and bushes in their way.
What causes a sand dune to move? _____

_____

_____

ii. Explain one method which can be used to stop the movement of sand dunes along coastal areas? _____

_____

iii. Would your method be practical for stopping sand dune movement in desert areas? _____
Explain _____

_____

iv. Racing dune buggies over sand dunes is a popular pastime for some people. What effect do you think the dune buggies might have on the sand dunes?

_____

_____

_____

v. Many inland areas of Australia are unsuitable for use as farmland due to a covering of sand, silt or clay particles.
Suggest two possible ways by which some of this land could be converted to useful farmland.
(a) _____
(b) _____

vi. The erosive effect of wind is much more effective in very hot, dry desert areas. Explain.

_____

_____

_____

1. What are the two main weathering agents in arid regions?

   (a) _____

   (b) _____

2. How does wind sort out larger, heavier grains of sand from smaller, lighter grains?

   _____

   _____

   _____

3. Compare the abrasive effect of wind-borne grains of sand on sandstone and granite. Explain any differences you give.

   _____

   _____

   _____

   _____

   _____

4. Explain how clumps of vegetation can cause the wind to drop part of its load of sand grains.

   _____

   _____

   _____

   _____

5. Name 3 factors which increase erosion caused by wind blowing loose soil away.

   (a) _____

   (b) _____

   (c) _____

6. What is the main method we use to stabilize soil likely to be eroded by wind?

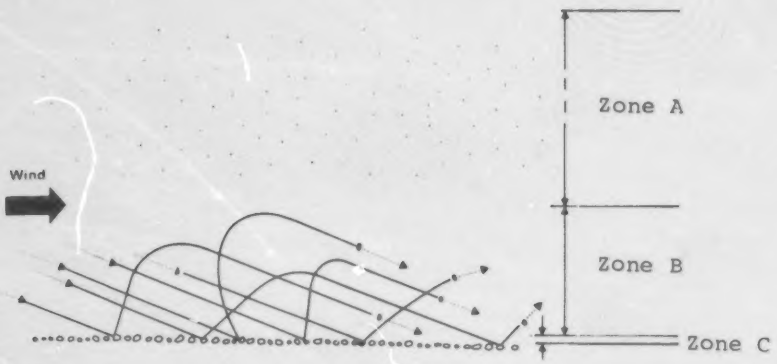
   _____

7. Explain how this method prevents soil erosion.

   _____

   _____

The next 2 questions refer to the diagram below. The diagram shows material being transported by wind.



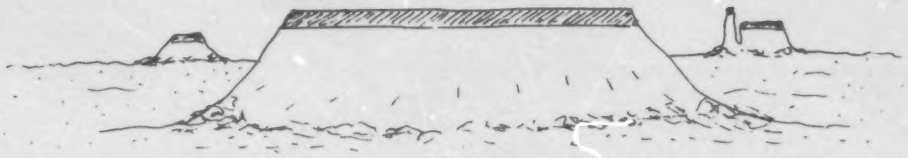
(1) What process transports particles in

(a) zone A _____
(b) zone B _____
(c) zone c _____

(2) Describe the grain size of the particles transported in each zone relative to the size of a grain of beach sand.

(a) zone A _____
(b) zone B _____
(c) zone C _____

The diagram below refers to the next question.



A flat-topped hill like the one shown in the diagram often form in desert areas.

(a) What are these features called? _____

(b) Why is the top of the hill flat? _____

_____

(c) Why does the hill rise steeply from the surrounding flat desert?

_____

_____

(d) Of what larger structures were these originally a part?

_____

_____

1. (i) Name the process by which wind transports sand grains.

_____

(ii) Explain how this occurs. _____

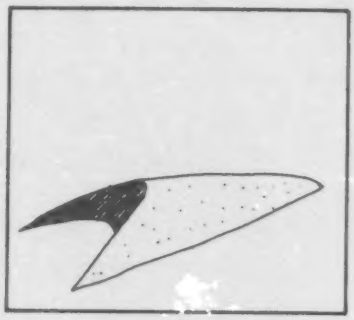
_____

(iii) Wind-blown sand deposits have a number of very characteristic features. Name two of these.

(a) _____

(b) _____

2. (i) The diagram (right) shows a crescent-shaped sand dune, which is called a _____



(ii) Show the prevailing wind direction on the diagram.

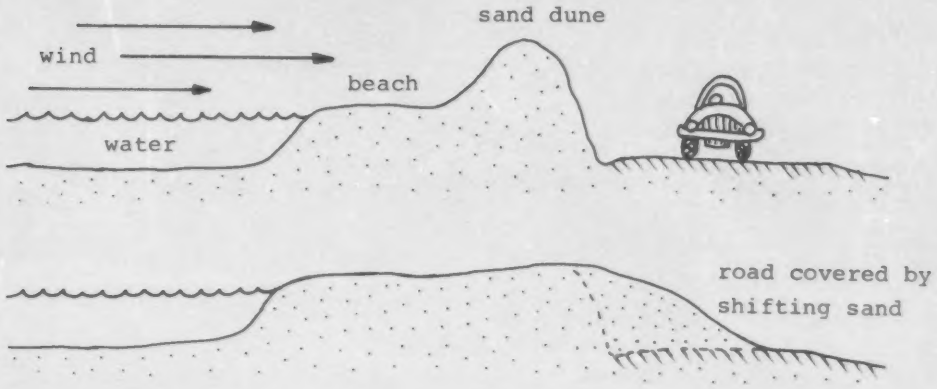
(iii) Where in Australia would you expect to find such sand dunes _____.

3. Explain how story or gibber deserts are formed by wind action. _____

_____

_____

The questions on this page refer to these diagrams:-



1. Give 3 ways the problem shown in these diagrams could be overcome.

   a) _____
   b) _____
   c) _____

2. Which of these methods do you think would be the best to use?

   _____

3. Why?

   _____
   _____
   _____

4. Where else (other than on the coast) would you expect to find this sort of erosion?

   a) generally? _____
   b) specific example in Australia. _____

5. Why is this erosion a problem along coastal roads. (Give 3 reasons).

   a) _____
   b) _____
   c) _____

Classify each of the following statements as TRUE or FALSE by placing a tick in the appropriate column.

	TRUE	FALSE
1. Longitudinal dunes run at right-angles to the dominant wind directions.		
2. Transverse dunes run at right-angles to the dominant wind directions.		
3. Barchan dunes have their concave side facing the wind.		
4. Transverse dunes are crescent shaped		
5. Wind-blown sand deposits are called Loess.		
6. Sand is carried by saltation by the wind.		
7. Only fine sand and smaller particles can be carried in suspension by the wind.		
8. The wind can erode existing rock surfaces by abrasion.		
9. Sief dunes are formed when there are 2 major wind directions.		
10. Yardangs are wind blown dust deposits.		

Complete the following:-

11. The process by which sand is carried by the wind is called _____.

12. Where is the erosive effect of the wind most effective? _____.

13. A flat topped hill found in desert areas is known as a _____.

14. Name a type of sand dune. _____

15. A sandy desert is called a _____.

16. A rocky desert is sometimes known as a _____.

17. The process of wearing down a rock by alternately heating and cooling its outer layer is called _____.

18. Sand grains carried by wind have a _____ appearance.

19. Name a crescent shaped dune which has converse sides facing the wind _____.

20. What is a hill of sand? _____

Answer the following in the spaces provided.

1. Pebbles which show highly polished, flat surfaces due to wind erosion are called _____.

2. Material carried in suspension by the wind is called _____.

3. The diagram below shows a cross-section of a ripple mark on a sand dune.

Indicate the wind direction by drawing an arrow above the diagram

4. When a winds suspended load settles out, a deposit called _____ if formed.

5. Explain how current bedding is formed in wind-blown sand deposits.

_____

_____

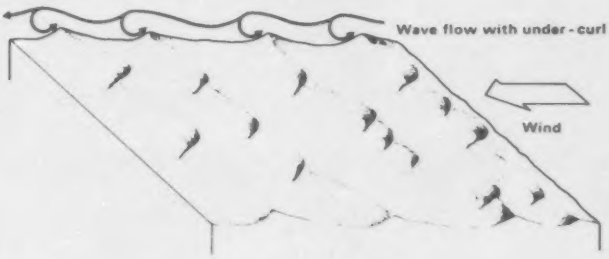
_____

_____

_____

6. Sand grains carried by wind have a __ _____ appearance.

1. The next 3 questions refer to this diagram of a series of sand dunes.



(i) What name is given to this type of dune?

_____

(ii) Mark the slip-face of a dune on the diagram with an "S".

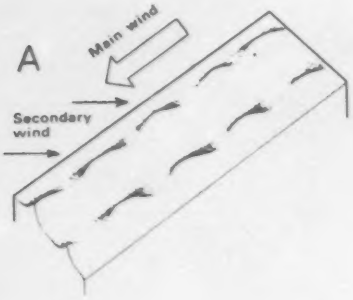
(iii) Mark the lee slope of a dune on the diagram with an "L".

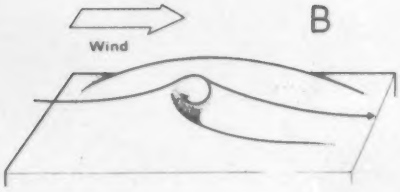
2. Indicate on the diagram (below) the direction of the wind needed to produce the sand dunes drawn.

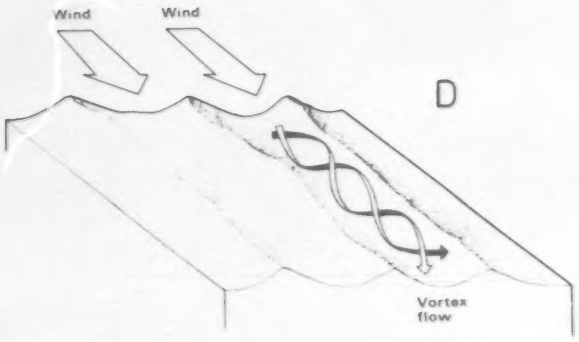
3. What process is represented by the diagram

_____

1. What name is given to each of the types of sand dunes represented by the diagrams below?







A _____ C _____

B _____ D _____

2. State three factors which determine the type of sand dunes which may form in a desert.

(i) _____

(ii) _____

(iii) _____

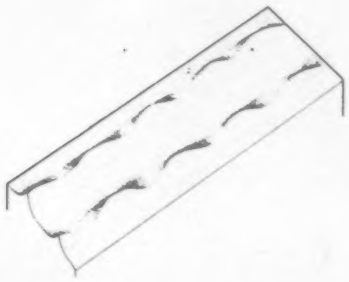
1. The diagram below shows a series of sand dunes.

(i) What type of dune is represented by the diagram above?

_____

(ii) Mark, with an arrow, the main wind direction.

2. The next 3 questions refer to this diagram of sand dunes.



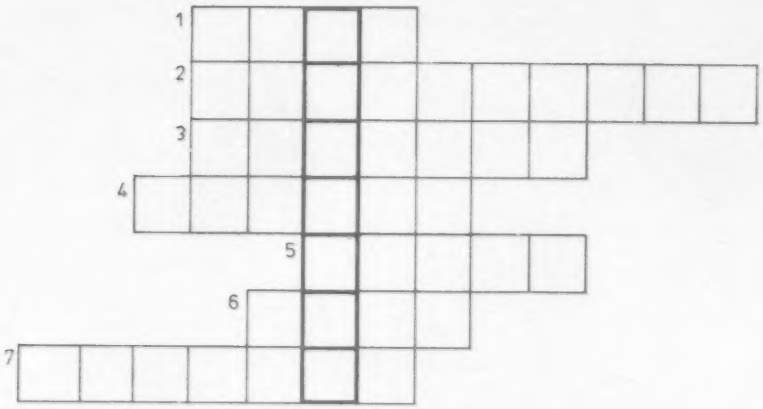
(i) What name is given to this type of dune? _____

(ii) Mark on the diagram the main wind direction (arrow A).

(iii) Mark on the diagram the secondary wind direction (arrow B).

1. Unscramble each of the following words and write each in the appropriate place in the word diagram below.

(a)	EUDN	- a hill of sand
(b)	ANRTEEVRS	- a dune which forms at right angles to the wind direction
(c)	OORINES	- the wind does this by abrasion
(d)	ESTRED	- an arid, sandy region
(e)	SLOES	- a deposit of wind carried dust
(f)	FISE	- a dune formed when there are two dominent wind directions
(g)	RHCABAN	- a crescent shaped sand dune



Unscramble the letters in the darker boxes to answer this question.

What is the general term used to describe erosion and deposition by wind? _____

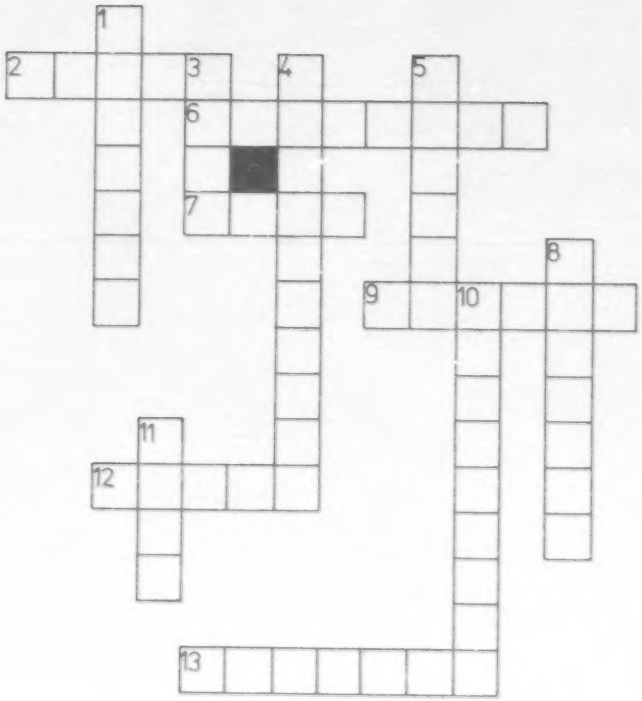
Answer each of the following questions in the spaces below.

ACROSS

2. Unstratified fine-grained sediment deposited by wind.
6. Process by which wind wears down rock.
7. A ridge of wind-blown sand.
9. A dry region covered mainly by sand.
12. An isolated hill with very steep sides, also called a mesa.
13. A crescent shaped dune which has the convex side facing the wind.

DOWN

1. A term applied to wind deposition and wind erosion.
3. The bed load carried by the wind.
4. A dune which runs at right-angles to the dominant wind direction-has a very asymetrical shape.
5. A structure noticeable on the surface of most wind blown sand deposits.
8. The appearance of the surface of wind carried sand- grains when viewed through a hand lens.
10. The process by which most sand grains are moved.
11. Material carried in suspension by the wind.



Answer the following questions to complete the crossword below:

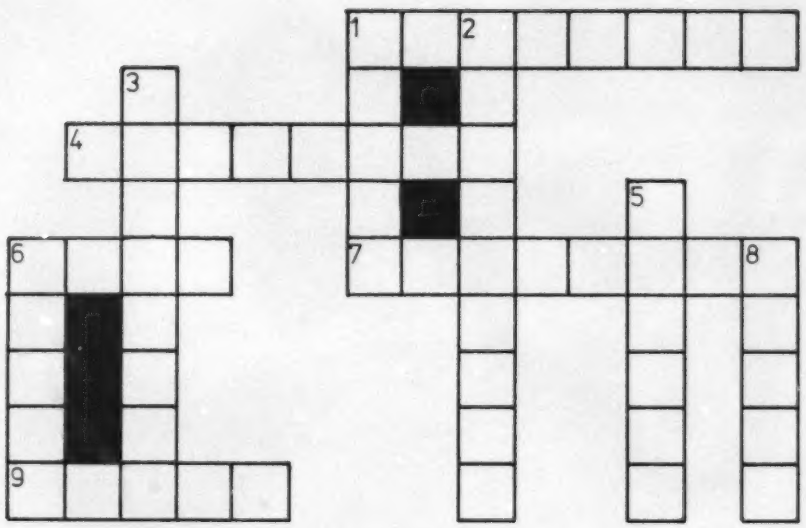
CLUES

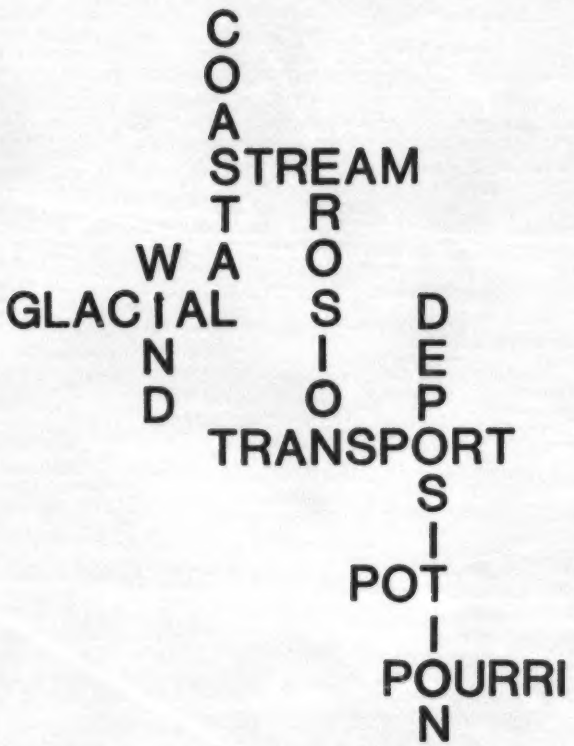
ACROSS

1. The ultimate product of arid erosion, when mountains are finally removed to form the _____ plain.
4. A fan shaped sand dune.
6. A dry river bed.
7. _____ fans form in desert areas when infrequent streams flow from mountains onto plains and drop their sediment.
9. A small flat-topped hill in desert areas.

DOWN

1. A dry salt lake.
2. Ayer's Rock is an example of one of these.
3. Formed by wind and common in deserts and along coastlines.
5. A flat, stony plain formed by wind.
6. A prominent agent of erosion in arid regions.
8. An unstratified deposit consisting of silt and fine wind-blown sand.




C
O
A
STREAM
T R
W A O
GLACIAL S D
N I E
D O P
TRANSPORT
S
I
POT
I
POURRI
N

1. Which occurs first, weathering or erosion?

   _____

2. What will be the shape of a valley eroded by a glacier?

   _____

3. What will be the shape of a valley eroded by a river?

   _____

4. In what sort of landscape will you most probably find a hanging valley?

   _____

5. Name three agents of erosion:
   (i) _____
   (ii) _____
   (iii) _____

6. In which tract of a stream would you most probably see an oxbow lake.

   _____

7. In which tract of a stream would you most probably find a set of rapids.

   _____

8. Name one feature caused by wind erosion.

   _____

9. Name 3 features caused by glacial erosion.
   (i) _____
   (ii) _____
   (iii) _____

10. (i) A stream flows around a curving meander. Will erosion occur on the inside bank of the meander or the outside bank?

    _____

    (ii) Explain why?

    _____

11. A cliff face made up of layers of shale and sandstone is eroded by waves. Which of the rock types would you expect to be eroded the fastest?

    _____

12. Which section of a glacier moves most rapidly, the middle or the edge?

_____

13. Where are you most likely to find a stack?

_____

14. Where are you most likely to find a levée bank?

_____

15. What is the name given to the sediment deposited at the end of a glacier?

_____

16. A rock has a highly polished, almost flat surface with striations across it. What might have caused this feature?

_____

17. Name 2 methods by which a stream erodes its channel.

(i) _____

(ii) _____

18. In which tract of a river is most of the erosion occurring.

_____

19. In which tract of a river is most of the deposition occurring?

_____

20. Name 3 features caused by coastal erosion.

(i) _____

(ii) _____

(iii) _____

1. Suggest two ways in which wind erosion is similar to erosion by running water.

   i. _____

   ii. _____

2. Fill in the table by ticking the appropriate column(s)

Features	Which agent of erosion produces each feature?			
	Wind	Streams	Ice	Waves
cirque				
waterfall				
U-shaped valley				
meander				
arch				
hanging valley				
alluvial fan				
stack				
billabong				
V-shaped valley				
delta				
moraine				
mesa				
sand dune				
rock platform				
spit				
levee				
gibber				
playa				
wadi				

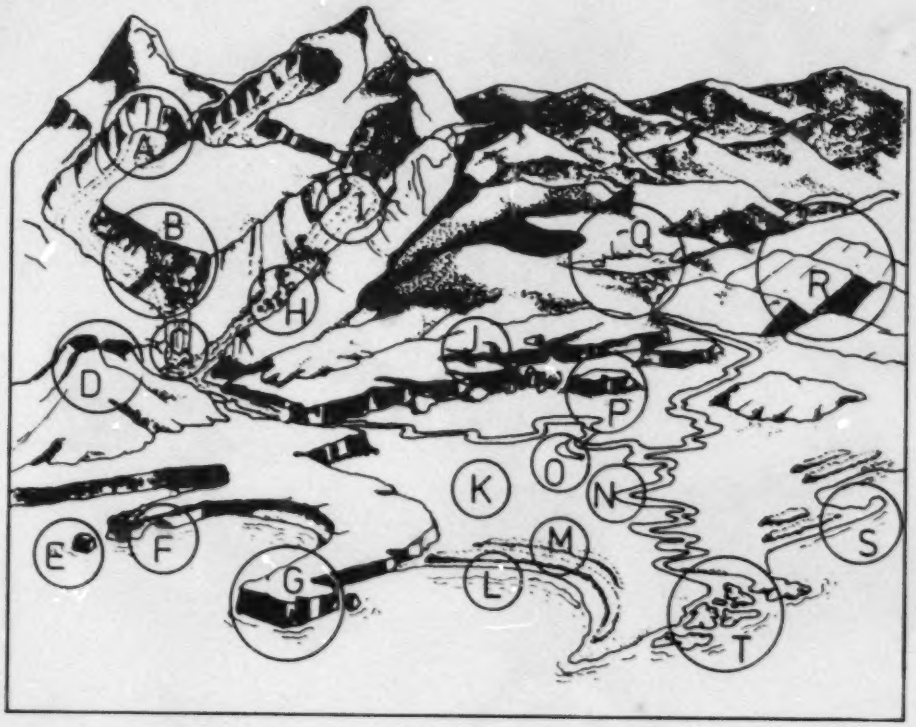
The questions on this page refer to this diagram.

. All the features below can be found on this map.

. Identify each feature by writing its letter (A to T) on the map where the feature has been drawn.

A. Alluvial fan
B. Arch
C. Billabong
D. Canyons
E. Cirque
F. Delta
G. Fault Mountains
H. Flood Plains
I. Glacier
J. Hanging Valley
K. Lake
L. Meanders
M. Mesa
N. Morain
O. Sand Dunes
P. Stack
Q. U Shaped Valley
R. Volcanoes
S. Waterfall
T. Young Mountains

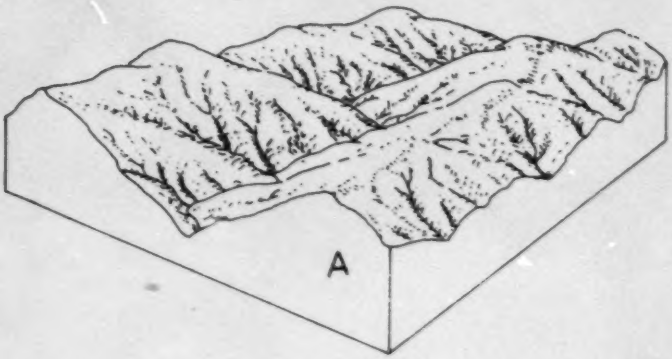
The question on this page refer to this diagram.

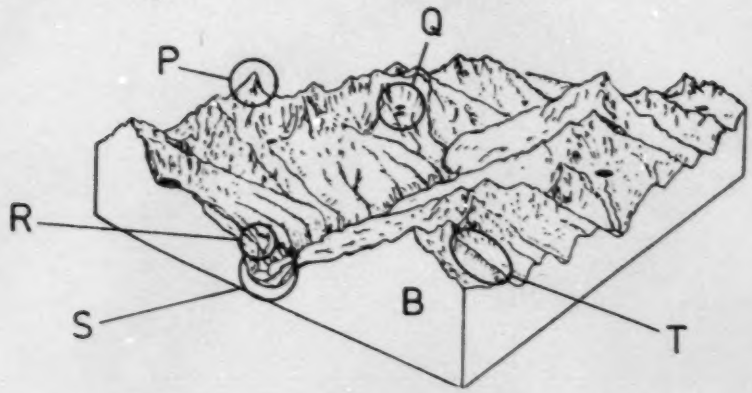


. Several features have been labelled on the diagram above, A to T.
. Identify each feature.

A		K	
B		L	
C		M	
D		N	
E		O	
F		P	
G		Q	
H		R	
I		S	
J		T	

The questions on this page refer to these diagrams:





1. What does diagram A show? _____

_____

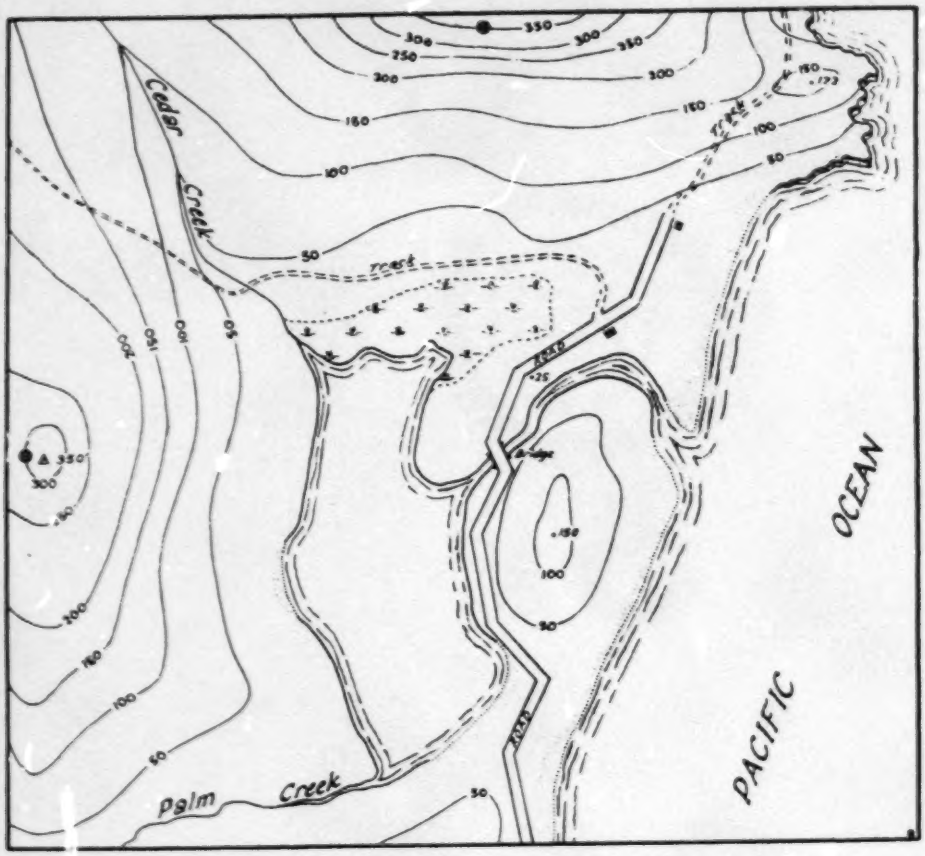
2. What does diagram B show? _____

_____

3. Complete the table below by identifying each feature labelled on the diagrams.

FEATURE	NAME OF FEATURE
P	
Q	
R	
S	
T	

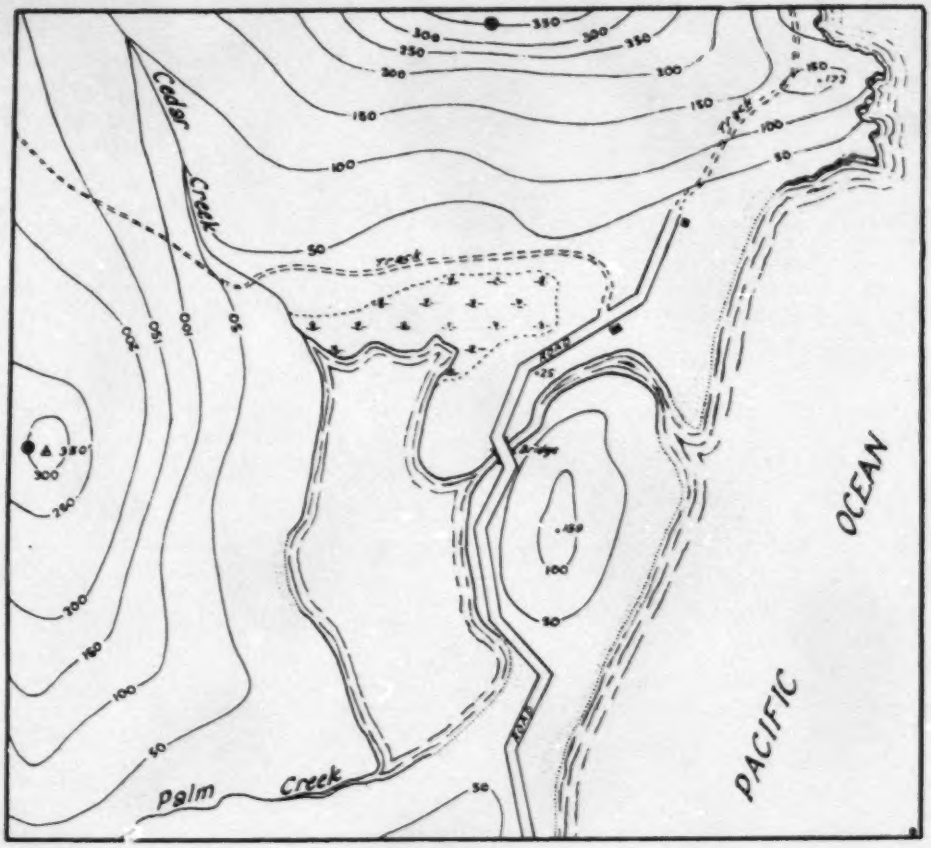
The questions on this page refer to the map below:



On the diagram label the following features by writing A,B,C, ... in the relevant positions on the map. Some features may not be present.

A. Lagoon
B. Sand bar
C. Beach
D. Swamp
E. Headland
F. Tributary
G. Meander
H. Hilltop
I. Valley
J. Estuary

The questions on this page refer to the map below:



Describe the area the map is showing?

_____

_____

_____

_____

_____

Identify and label 10 features on the map.

For each of the following sets of questions match the terms in column 1 with those in column 2 by writing the letters (A-H) in the spaces next to the terms in column 2. The terms in column 1 may be used more than once, or not at all.

Column 1	Column 2	
A. base level	. V shaped valleys	_____
B. flood plain	. erosion remnants	_____
C. levee	. waterfalls	_____
D. old stream	. deposits if alluvium	_____
E. mature stream	. meandering across	_____
F. young stream	. flood plain	_____
	. sediment banks along river channel	_____
	. point below which streams cannot erode	_____

Column 1	Column 2	
A. arch	. river meets sea	_____
B. beach	. remnant of headland	_____
C. delta	. extended sand bar	_____
D. dune	. rocks projecting from ocean	_____
E. rock platform	. composed of sand	_____
F. spit	. unconsolidated sediment	_____
G. stack	. remnant as cliff recedes	_____
H. land tied island		

Column 1	Column 2	
A. alluvial fan	. any eroded stream channel	_____
B. canyon	. deposit of sediment	_____
C. gibber plain	. dry salt deposit	_____
D. mesa	. flat-topped hill	_____
E. playa lake	. residual pebble surface	_____
F. wadi		

1. Ice, wind and water transport all have different effects. The things listed below are all caused by one or more of wind, ice and water transport.

   Look at each sedimentary structure, degree of sorting, sediment type and rock type below. Choose the method(s) of transport in each case and indicate your choice(s) with a tick (or ticks).

		Method of Transport		
		Wind	Water	Ice
Sedimentary Structures	graded bedding Ripple Marks Cross bedding Mud cracks Scour and fill			
Degree of Sorting	Well sorted sand unsorted sediment poorly sorted sediment			
Sediment Type	Sand dune moraine delta alluvial fan loess			
Rock Type	fluvial sandstone aeolian sandstone tillite			

2. A large boulder is found in the middle of a field. It is of a rock type not found in the area, but found in mountains 50 km to the west. Explain how it may have been transported to its present position.

   _____

   _____

   _____

1. The list below, contains descriptions of sediments found at various sites. Select from the list of Methods of Transport the most likely method by which each sediment was transported. Each method may be used more than once or not at all.

Method of Transport

1. A mountain stream.
2. A river in its mature time.
3. A glacier.
4. A wind.

Sediment

A. Extremely poorly sorted. Many angular fragments. An extremely large range of grain size. _____

B. Poorly sorted. Fragments quite angular. Large range of grain size. _____

C. Well sorted. Fragments round and sand size. _____

D. Very well sorted. Fragments rounded and with pitted surface. Fragments of fine sand size. _____

E. Sediment deposited in a large mound. Extremely poorly sorted Fragments range from fine powder to boulders 5m across.

_____

2. Complete this table.

TYPE OF DEPOSIT	DEGREE OF SORTING	SHAPE OF GRAINS	RANGE OF GRAIN SIZE
Tillite			Very fine to very large
Sand Dune			
Bed of River in Mature Tract			
	Poorly Sorted	Angular	
Beach Sand			

1. Complete the table below:

Where sand grain is found	Description of sand grain	Diagram of sand grain
Immature tract of a river		
Mature tract of a river		
Coastal tract of a river		
Desert		

2. How would you distinguish between sediment deposited by a mountain stream and sediment deposited by a glacier?

_____

_____

_____

3. Name 4 ways a river transports its load of sediment.

(i) _____

(ii) _____

(iii) _____

(iv) _____

1. Gold forms only a small percentage of the bedrock of a stream.

   (i) Explain how gold is concentrated into significant deposits by a stream. _____

   _____

   _____

   _____

   _____

   _____

   (ii) What is bedrock? _____

   _____

   _____

   (iii) If gold sets on the bed of a river for some time, why isn't it chemically weathered? _____

   _____

   _____

   (iv) Is gold susceptible to mechanical weathering? Explain.

   _____

   _____

   _____

   _____

2. Where would you find each of the following sedimentary deposits?

   (i) alluvial fans _____

   _____

   (ii) deltas _____

   _____

   (iii) lateral moraines _____

   _____

   (iv) levée banks _____

   _____

   (v) medial moraines _____

   _____

   (vi) terminal moraines _____

   _____

1. Give meanings for each of the following terms:

   (i) Aeolian _____

   _____

   (ii) Alluvial _____

   _____

   (iii) Deltaic _____

   _____

   (iv) Fluvial _____

   _____

   (v) Glacial _____

   _____

   (vi) Loess _____

   _____

   (vii) Lacustrine _____

   _____

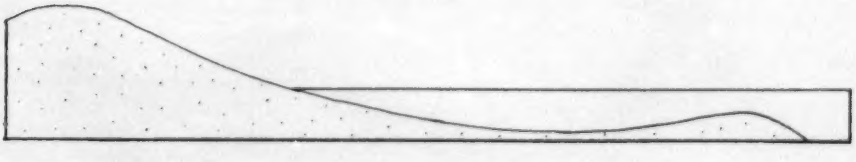
2. In what sort of environment are clay-sized particles deposited? _____

   _____

3. What would be the main components of a sandy beach?

   _____

4. The cross section below is a beach profile showing a sand dune, beach area, and offshore bar.



   (i) Label each of these features on the diagram.

   (ii) Why would the finest sand be found on the dune?

   _____

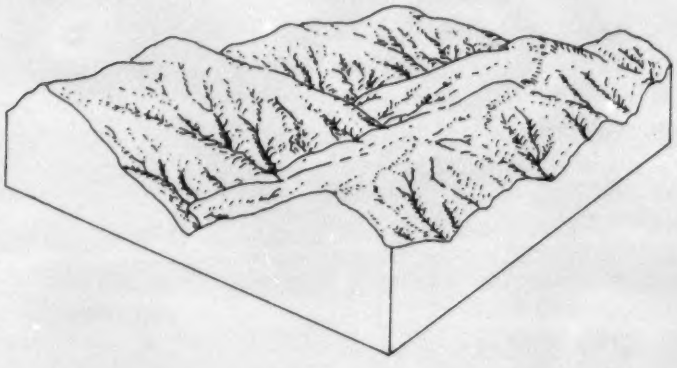
   _____

Answer the next 10 questions by filling in the blank spaces.

1. When waves approach a beach at an angle, _____ drift occurs.
2. If an unsorted load of sediment is dumped into still water and allowed to settle, a structure known as _____ bedding forms.
3. When water flows over unconsolidated sand, a structure known as _____ _____ may form.
4. The sediment which shows the highest degree of sorting comes from the _____ tract of a river.
5. The shape of sand grains in the immature tract of a river is generally _____.
6. Rivers transport their sediment in the bed load, in suspension, and in _____.
7. What type of sediment would be deposited in the middle of a lake? _____
8. Sediment which deposits at the mouth of a river forms a structure called a(n) _____.
9. Fine grained sediment transported by desert winds is called _____.
10. The most obvious difference between river and glacial sediment is the _____ of the grains.

Would the major agent in sculpting the landscape (right) be water, wind, or ice?

_____



Give evidence from the diagram to support your answer.

_____

_____

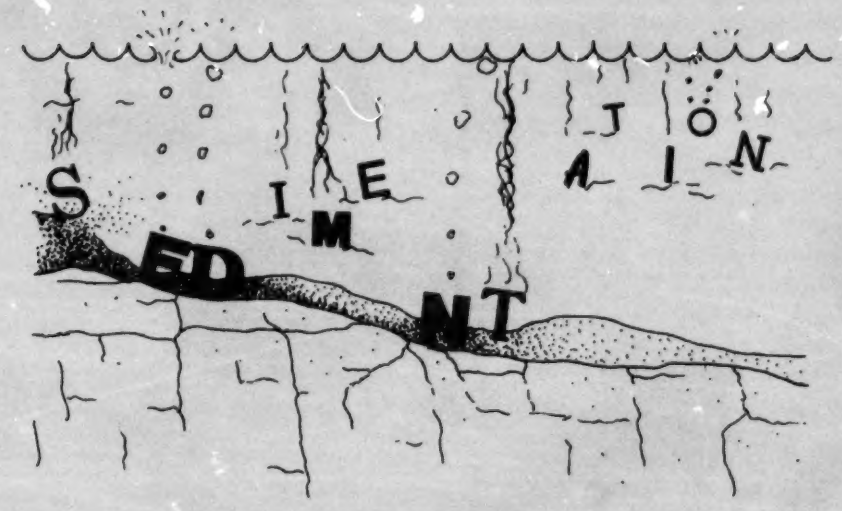
_____

Answer the next 10 questions by ticking the appropriate column.

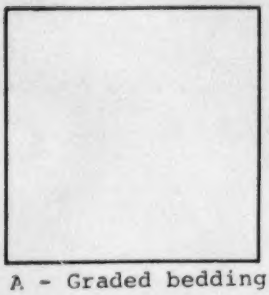
Q	STATEMENT	TRUE	FALSE
1.	Cross bedding can occur in sand dunes.		
2.	Ripple marks can be found in sand dunes.		
3.	Gravels are deposited in the mature tract of a river.		
4.	Most erosion occurs on the inside beach of a meander.		
5.	Degree of sorting of sediment refers to grain shape.		
6.	Till is deposited by streams.		
7.	Beach sand is well sorted.		
8.	A rutile deposit is unlikely to be found in the immature tract of a river.		
9.	Sediment deposited by a glacier can be distinguished from sediment deposited by a stream by the degree of rounding.		
10.	Sand is transported in a river in suspension.		

STRUCTURES

formed by

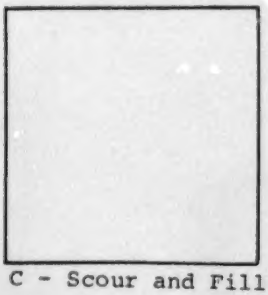


1. In the boxes provided, draw cross-sections of the sedimentary structures indicated.



A - Graded bedding

B - Mudcracks



C - Scour and Fill

D - Crossbedding

E - Ripple Marks

2. Briefly describe how each of these is formed.

A. Graded bedding _____

_____

_____

B. Mudcracks _____

_____

_____

C. Scour and Fill _____

_____

_____

D. Cross bedding _____

_____

_____

E. Ripple marks _____

_____

_____

1. The diagram below represents a sedimentary feature called graded bedding. It is produced when a mixture of sediments of various size are allowed to settle slowly. The layers are fine sand, coarse sand, mud and gravel (not necessarily in that order). Label the key beside the diagram to show correctly the composition of the layers.

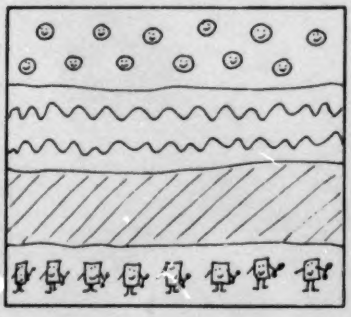
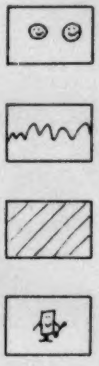


Diagram representing graded bedding



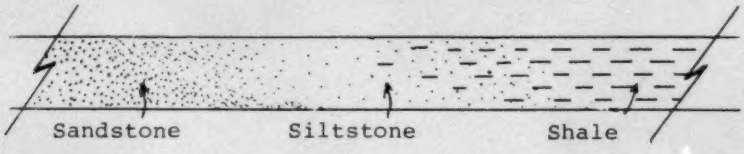
_____

_____

_____

_____

2. Study the diagram below, which represents a single bed in cross section and shows how the type of sediment changes laterally.



(i) Describe the environment of deposition needed to form each type of sediment.

A. Sandstone _____

_____

B. Siltstone _____

_____

C. Shale _____

_____

(ii) Explain how the above beds may have been formed?

_____

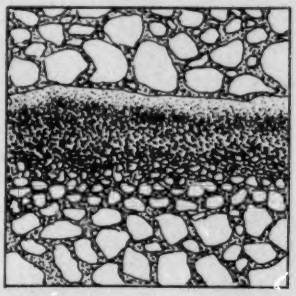
_____

_____

_____

_____

1. (i) What is the name given to the type of bedding shown in the diagram (right).



_____

(ii) Explain how this bedding might have formed.

_____

_____

_____

_____

_____

2. A geologist sees a shale which contains mud cracks.

(i) In what environmental conditions would you expect the shale to have formed? _____

_____

_____

(ii) Explain clearly how mud cracks form.

_____

_____

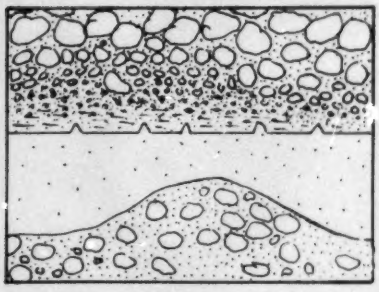
_____

(iii) Draw diagrams to show:

A. Mud cracks - top view

B. Mud cracks - cross sectional view

1. Study the diagram below; which represents a section of a wall of a road cutting.



A geologist who viewed the road cutting stated that the beds had been completely overturned. State and explain the 3 pieces of evidence in the section on which this judgement was based.

A. _____

_____

B. _____

_____

C. _____

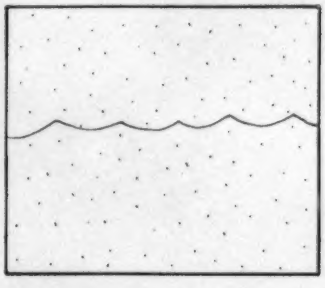
_____

2. The diagram below shows a sedimentary structure preserved in rock.

(a) What structure is shown?

_____

(b) Briefly describe how and where this structure might have been formed.



_____

_____

_____

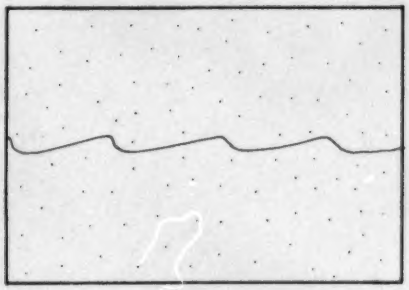
_____

_____

(c) In what sort of rock is this structure most likely to be found?

_____

The next 4 questions refer to the diagram below. The diagram shows a cross section of a sedimentary structure.



1. Name the structure.

   _____

2. Where would it be formed? _____

3. How would it be formed?

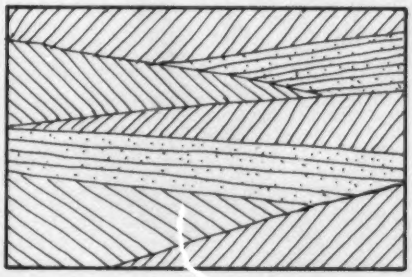
   _____

   _____

   _____

4. On the diagram place an arrow to show the direction of the current.

The next 4 questions refer to the diagram below, which shows a cross section of a sedimentary structure.



5. What structure is shown?

   _____

6. In what type of rock would you usually find structures like this?

   _____

7. How might this structure have formed?

   _____

   _____

   _____

8. Name two sedimentary environments in which you would expect this structure to form.

   (a) _____

   (b) _____

Fill in the missing words.

1. When sedimentary rocks are formed, they are very rarely deposited as large thickness of any one uniform rock type. Most sedimentary rocks are generally laid down in _____.

2. Variations within sedimentary rocks are due to _____ in conditions at the time of formation.

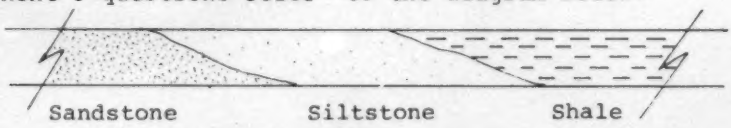
3. What are two factors that may cause one layer in a sedimentary rock to differ form another?
   i _____
   ii _____

4. A very thin layer (less than 1cm) in a sedimentary rock is called a _____ What rock type would this structure typically from in?_____

5. What causes each seperate narrow layer to form?
   _____
   _____

6. Name two places within a sedimentary environment where cross-bedding could typically occur.
   i _____
   ii _____

The next 3 questions refer to the diagram below.



The diagram shows a single bed of rock in cross-section. However, the type of sediment changes laterally. This represents a feature known as a marine transgression.

7. Where would you expect to find such a marine transgression.
   _____

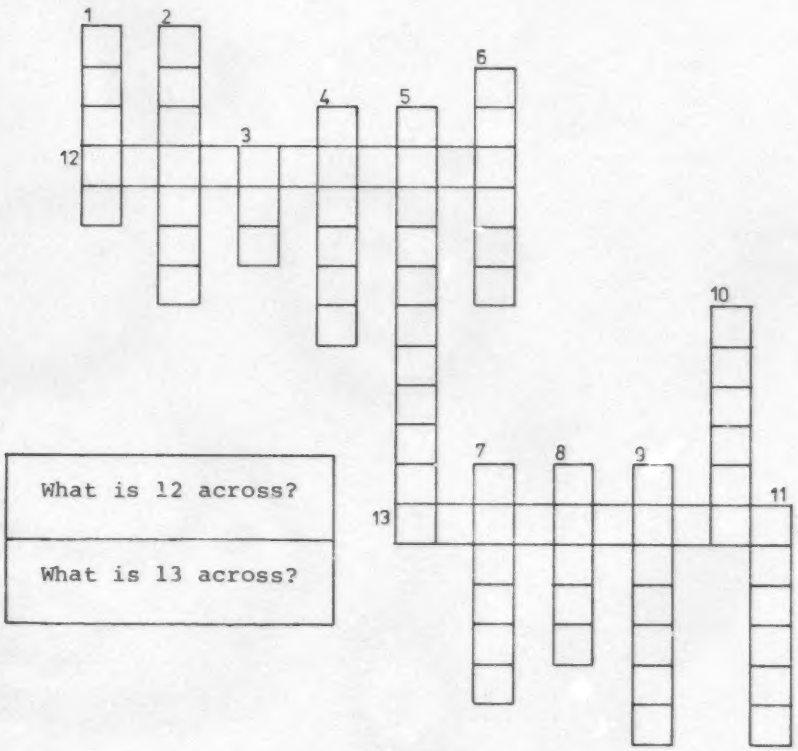
8. During the formation of such a marine transgression, one critical factor needs to be changing. What is this factor?
   _____

9. Explain clearly how such a lateral change of rock-type forms?
   _____
   _____
   _____
   _____
   _____

Fill in the missing words in the next 11 questions.

1. Sloping bedding layers formed at an angle to the main bedding is called _____ bedding.
2. Distinct sedimentary units are separated by _____ planes.
3. _ _____ balls are accumulations of fine sand & silt around plant roots.
4. Footprints preserved in fine sedimentary rock are called _____ tracks.
5. Fine sedimentary layers less than 1cm thick._____.
6. Sedimentary rocks are usually laid down in _____.
7. When the larger particles settle to the bottom, followed by increasingly smaller particles, the sediment is said to be _____.
8. Occurs when previously deposited sediments are removed to form a channel, later filled by differing sediment.
9. Structures left by worms.
10. These marks occur as parallel ridges formed in shallow water conditions.
11. Layers of sedimentary rock.

Now write each of the 11 words in this word puzzle.



What is 12 across?

What is 13 across?

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